FIG. 1

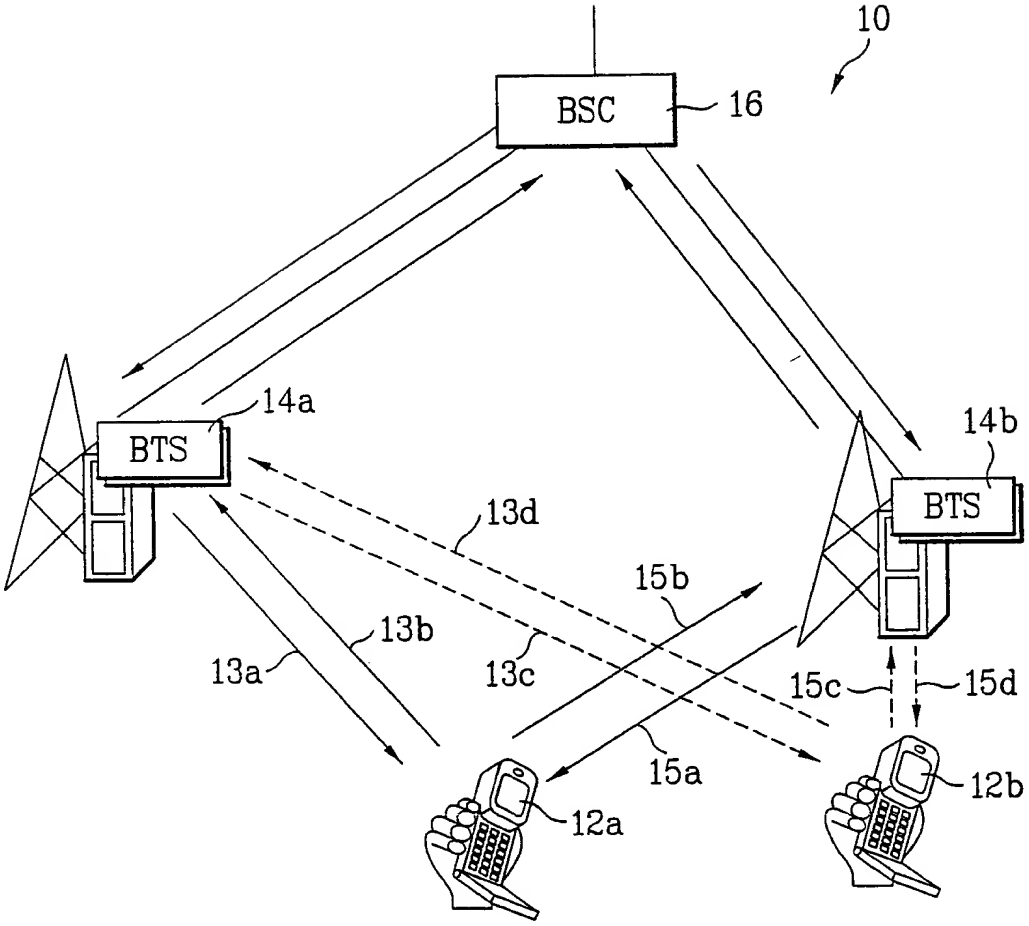

FIG. 2

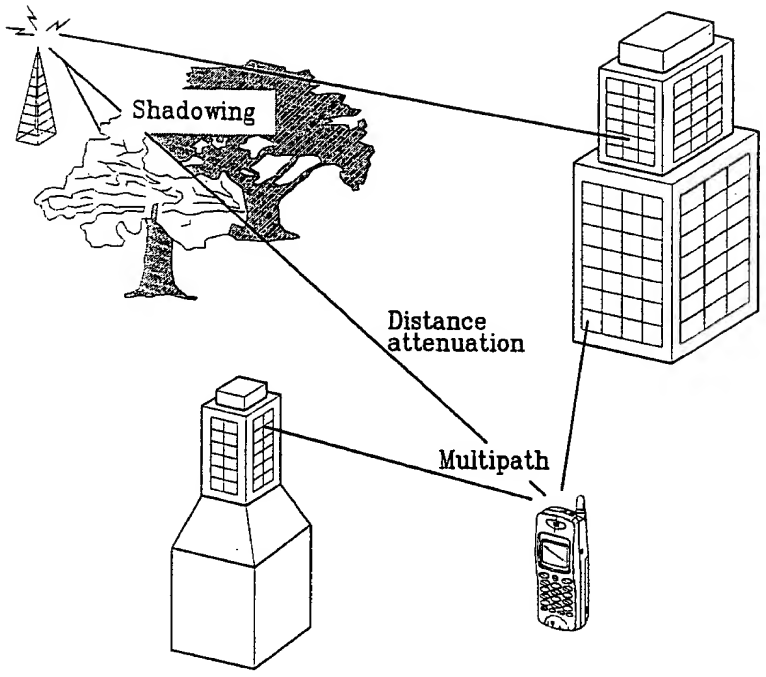
Shadowing
Distance attenuation
Multipath

FIG. 3

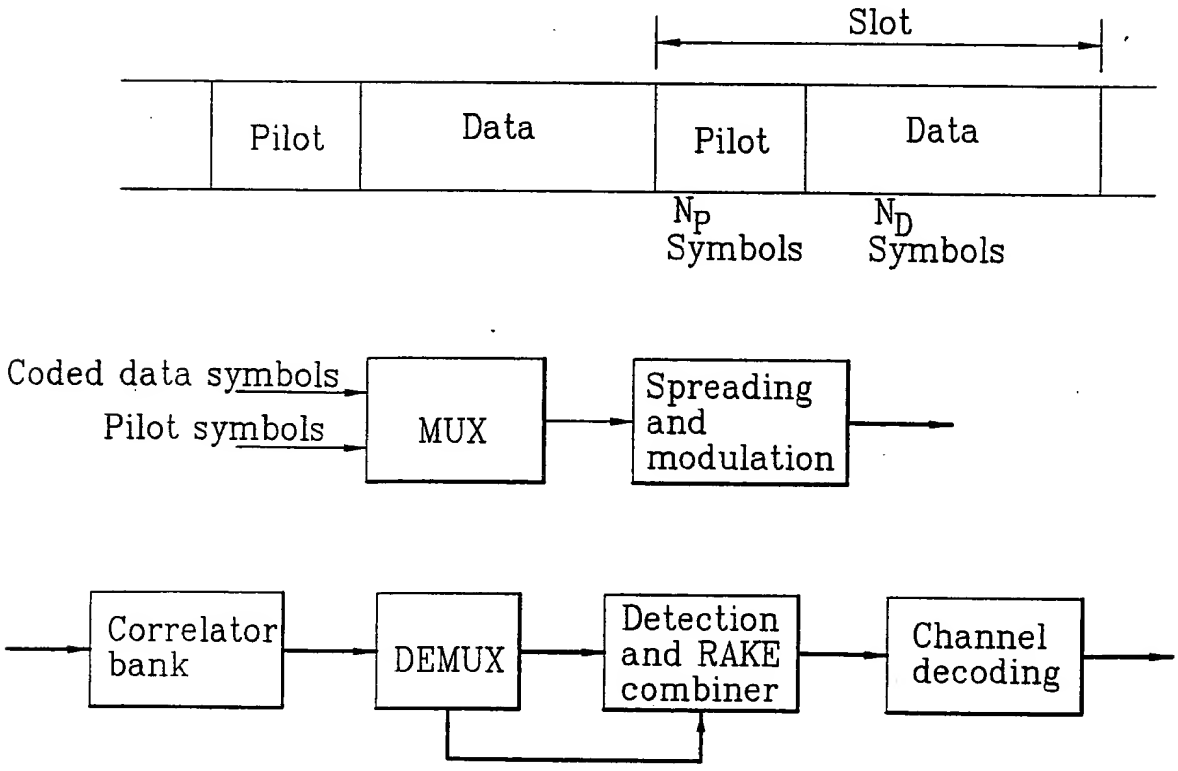
Slot
Pilot
Data
Pilot
Data
N_P Symbols
N_D Symbols
Coded data symbols
Pilot symbols
MUX
Spreading and modulation
Correlator bank
DEMUX
Detection and RAKE combiner
Channel decoding

FIG. 4

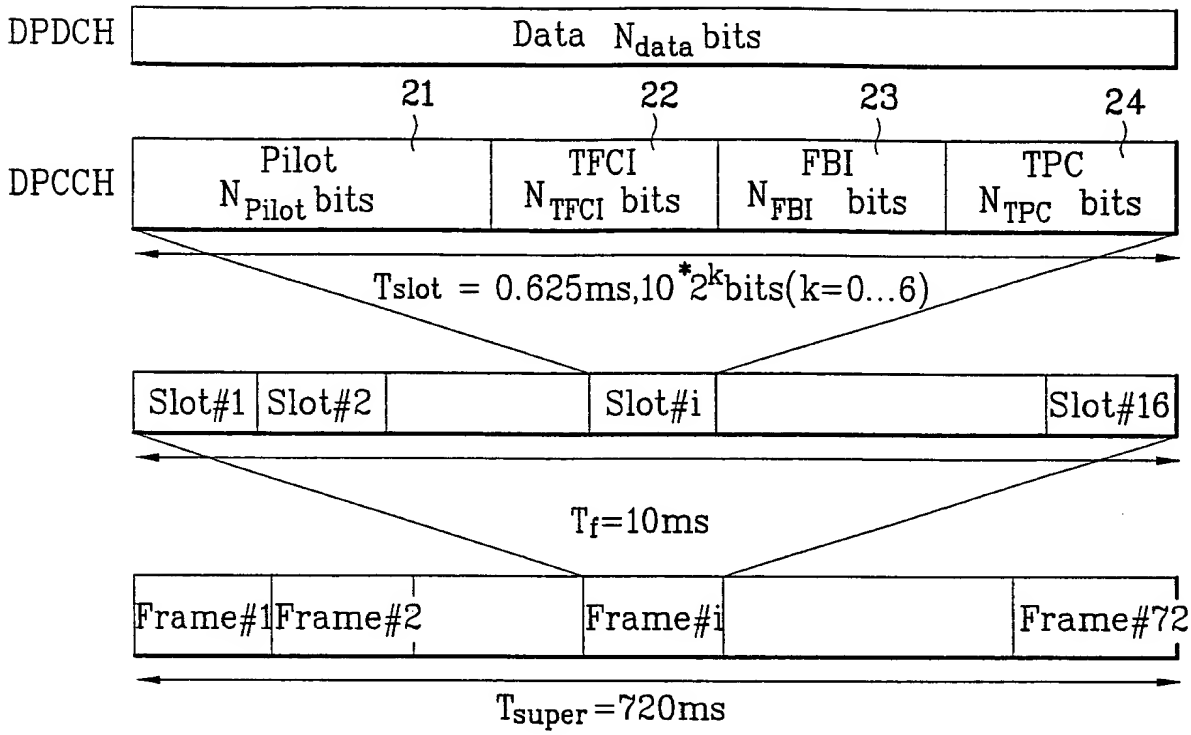

FIG. 5

Channel Bit Rate(kbps)	Channel Symbol Rate(ksps)	SF	Bits/ Frame	Bits/ Slot	N_{pilot}	N_{TPC}	N_{TFCI}	N_{FBI}
16	16	256	160	10	6	2	2	0
16	16	256	160	10	8	2	0	0
16	16	256	160	10	5	2	2	1
16	16	256	160	10	7	2	0	1
16	16	256	160	10	[6]	[2]	[0]	[2]
16	16	256	160	10	[5]	[1]	[2]	[2]

FIG. 6

	$N_{pilot}=6$						$N_{pilot}=8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
slot #1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	0	1	1	1	1	1	1	0	1	1
3	1	0	1	1	0	1	1	0	1	1	1	0	1	1
4	1	1	0	1	0	1	1	1	1	0	1	0	1	1
5	1	1	0	1	1	1	1	1	1	0	1	1	1	1
6	1	1	0	1	1	1	1	1	1	0	1	1	1	1
7	1	0	1	1	0	0	1	0	1	1	1	0	1	0
8	1	1	0	1	0	1	1	1	1	0	1	0	1	1
9	1	1	1	1	0	0	1	1	1	1	1	0	1	0
10	1	0	1	1	0	1	1	0	1	1	1	0	1	1
11	1	1	1	1	1	0	1	1	1	1	1	1	1	0
12	1	0	1	1	0	1	1	0	1	1	1	0	1	1
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	1	0	1	0	0	1	1	1	0	1	0	1	0
15	1	0	1	1	0	0	1	0	1	1	1	0	1	0
16	1	0	0	1	0	0	1	0	1	0	1	0	1	0

FIG. 7

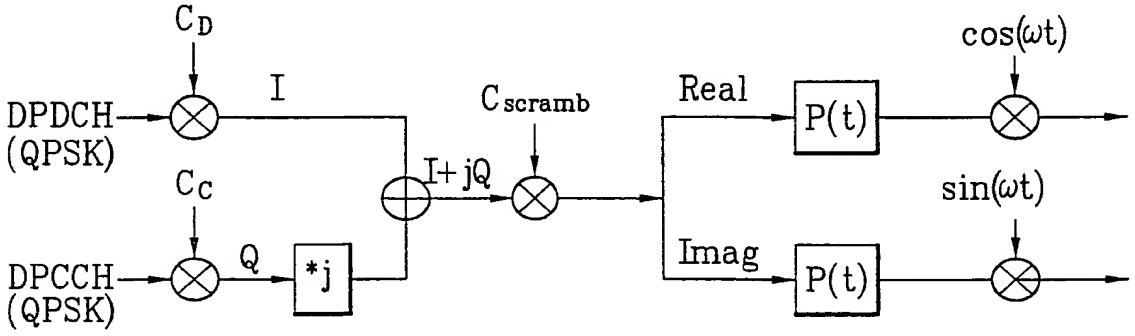

FIG. 8

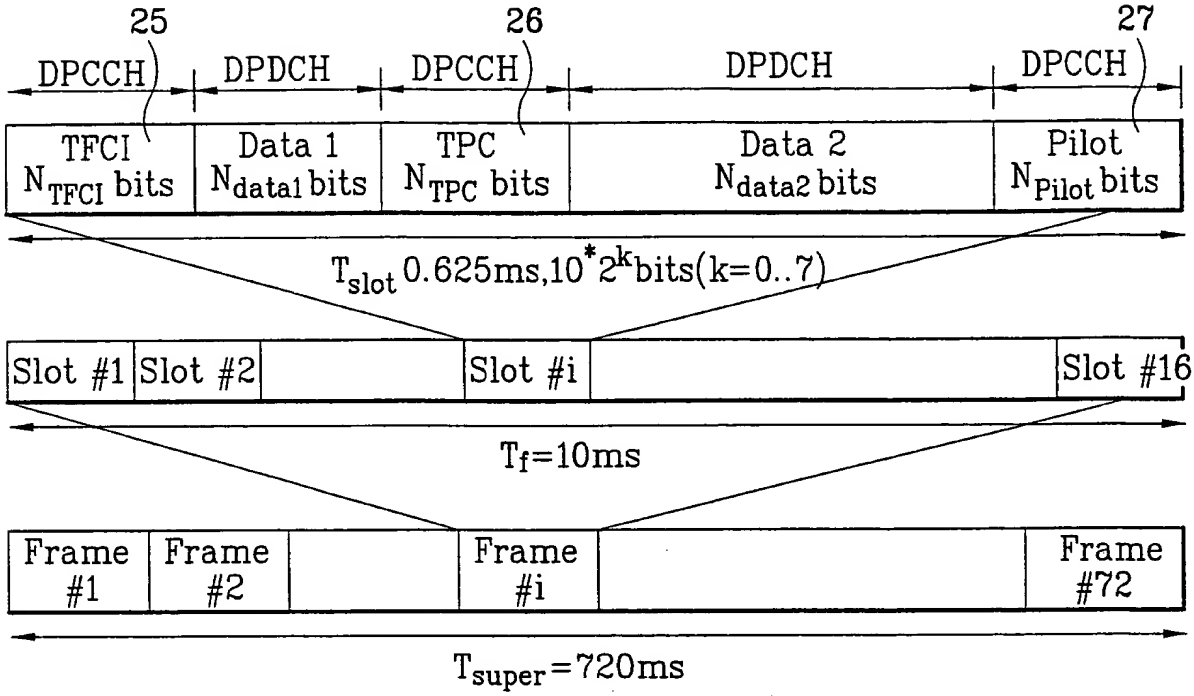

FIG. 9

Symblo rate	8ksps		16,32,64,128ksps				256,512,1024ksps							
Symblo #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	11	11	11	11	11	11	11	11	10
2	11	11	11	11	11	01	11	10	11	10	11	10	11	01
3	11	10	11	01	11	01	11	10	11	01	11	11	11	01
4	11	01	11	10	11	01	11	11	11	01	11	00	11	10
5	11	10	11	10	11	11	11	11	11	00	11	01	11	10
6	11	10	11	10	11	11	11	11	11	11	11	01	11	10
7	11	01	11	01	11	00	11	10	11	11	11	01	11	10
8	11	00	11	10	11	01	11	01	11	00	11	10	11	00
9	11	00	11	11	11	00	11	11	11	10	11	00	11	01
10	11	10	11	01	11	01	11	01	11	11	11	11	11	00
11	11	10	11	11	11	10	11	10	11	10	11	11	11	10
12	11	11	11	01	11	01	11	01	11	10	11	10	11	00
13	11	10	11	00	11	01	11	10	11	01	11	11	11	10
14	11	11	11	10	11	00	11	00	11	10	11	10	11	00
15	11	00	11	01	11	00	11	01	11	10	11	00	11	00
16	11	00	11	00	11	00	11	10	11	00	11	00	11	00

FIG. 10

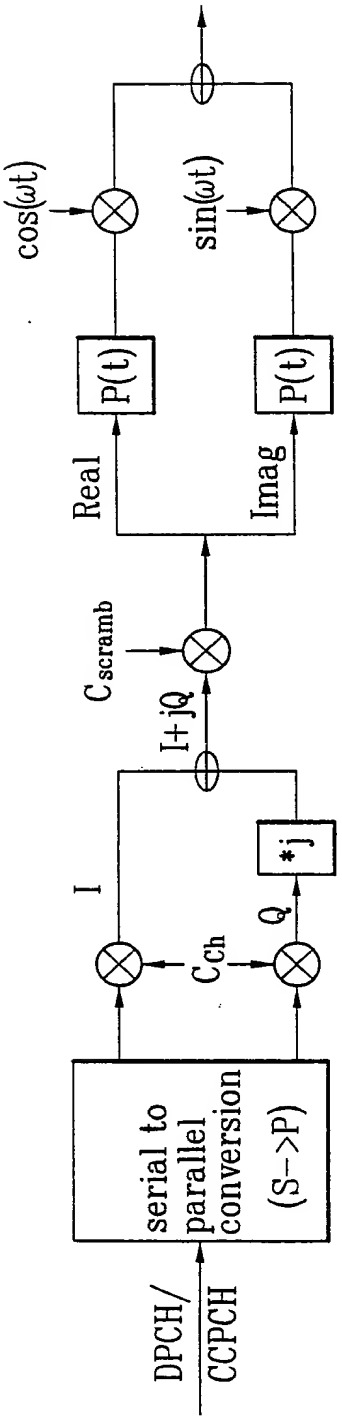
DPCH/
CCPCH
serial to
parallel
conversion
(S->P)
I
Q
C_{Ch}
*j
I+jQ
C_{scramb}
Real
Imag
P(t)
P(t)
cos(ωt)
sin(ωt)

FIG. 11A

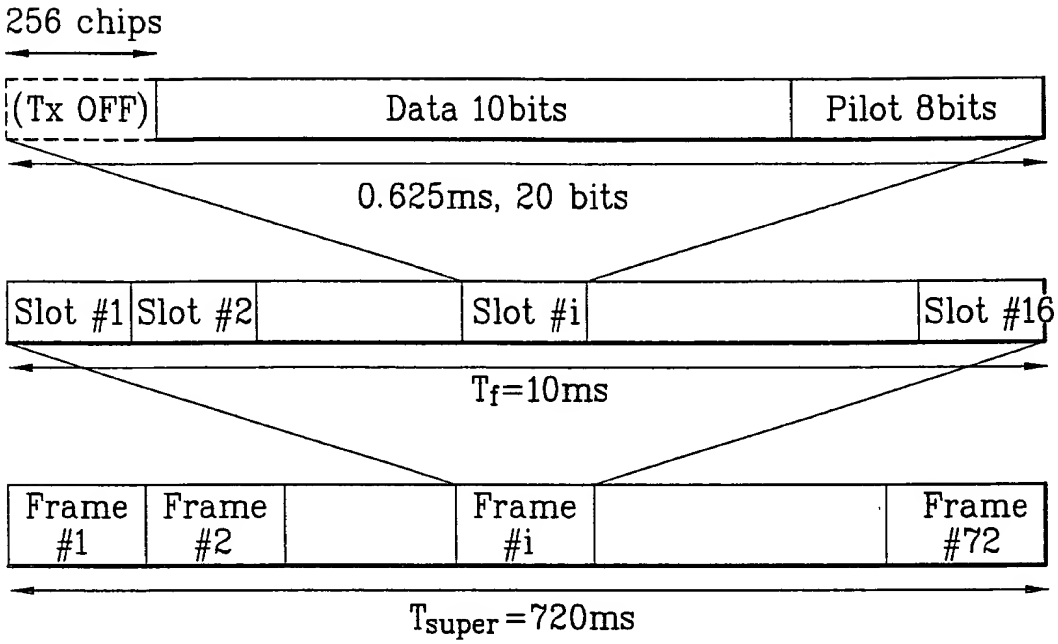

FIG. 11B

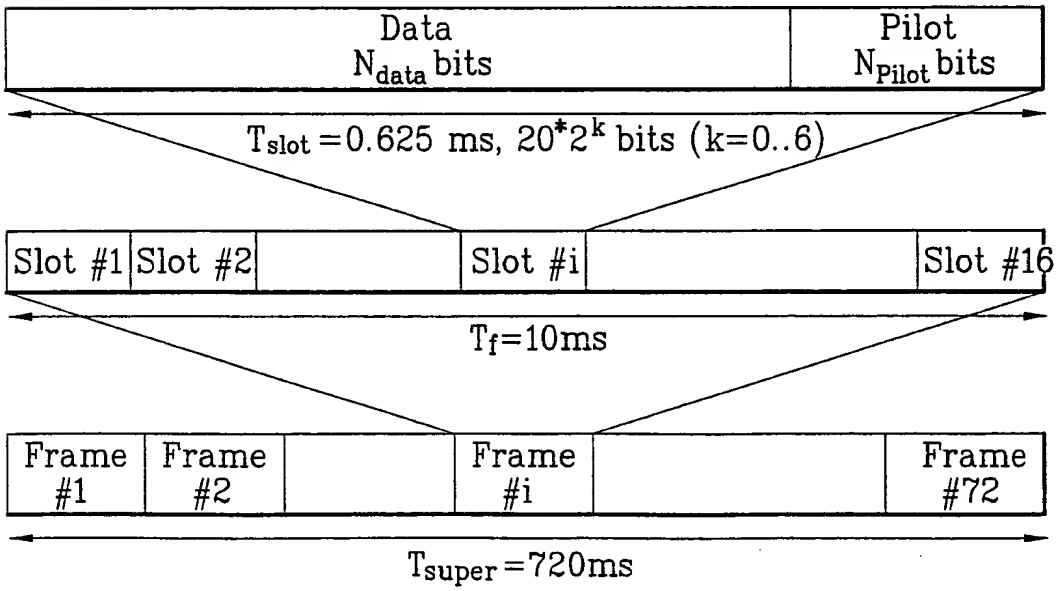

FIG. 12A

Frame Synchronization Words
Slot Number 1 2 3 4 5 L
$C_1 = (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0)$
$C_2 = (1\ 0\ 0\ 0\ 1\ 0\ 1\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 0\ 1)$
$C_3 = (1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 1\ 1)$
$C_4 = (0\ 1\ 1\ 1\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0\ 1\ 0\ 0\ 1)$
$C_5 = (1\ 0\ 1\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 1\ 1\ 1\ 1)$
$C_6 = (1\ 1\ 1\ 0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 1\ 1\ 0\ 1\ 0)$
$C_7 = (0\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 0\ 0)$
$C_8 = (1\ 1\ 1\ 0\ 1\ 0\ 0\ 1\ 0\ 0\ 0\ 1\ 0\ 1\ 1\ 0)$

FIG. 12B

$R(\tau)$ τ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$	16	4	0	4	0	−4	0	−4	−16	−4	0	−4	0	4	0	4
$R_F(\tau)$	16	−4	0	−4	0	4	0	4	−16	4	0	4	0	−4	0	−4
$R_G(\tau)$	16	4	0	−4	0	4	0	−4	−16	−4	0	4	0	−4	0	4
$R_H(\tau)$	16	−4	0	4	0	−4	0	4	−16	4	0	−4	0	4	0	−4

R_1 R_2

FIG. 13A

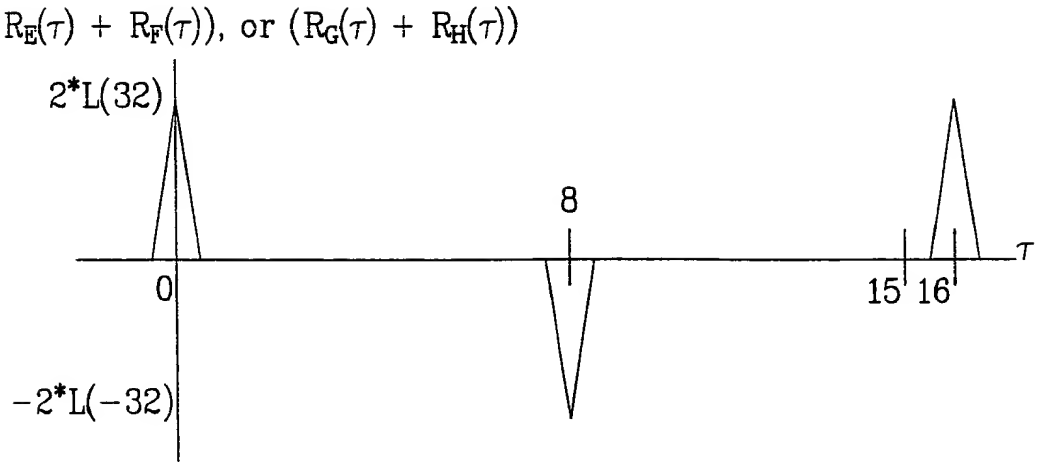

FIG. 13B

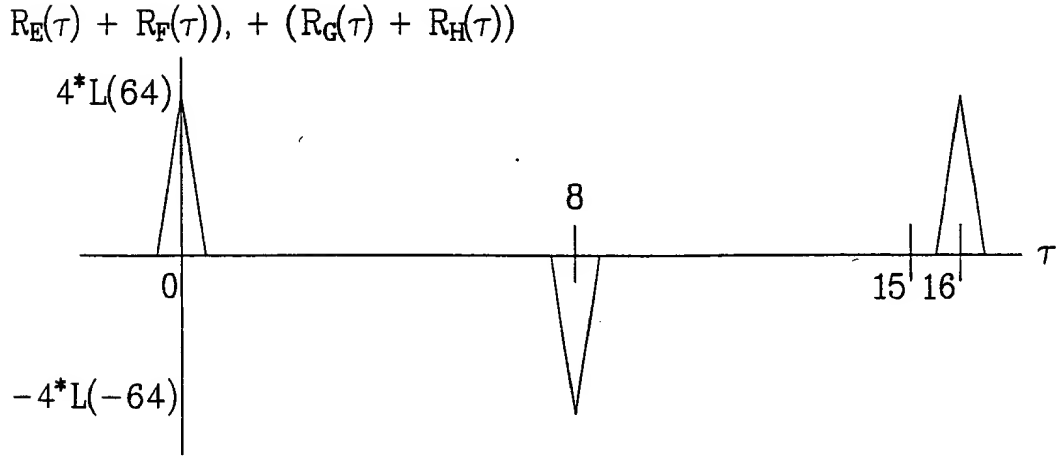

FIG. 14A

	$N_{pilot} = 5$					$N_{pilot} = 6$					
Bit #	0	1	2	3	4	0	1	2	3	4	5
Slot #1	1	1	1	1	0	1	1	1	1	1	0
2	1	0	1	1	1	1	1	0	1	1	1
3	0	0	1	0	1	1	0	0	1	0	1
4	1	0	1	1	1	1	1	0	1	1	1
5	1	1	1	1	0	1	1	1	1	1	0
6	1	0	1	1	1	1	1	0	1	1	1
7	1	1	1	0	1	1	1	1	1	0	1
8	1	0	1	0	0	1	1	0	1	0	0
9	0	0	1	0	1	1	0	0	1	0	1
10	0	1	1	0	0	1	0	1	1	0	0
11	1	1	1	1	0	1	1	1	1	1	0
12	0	1	1	0	0	1	0	1	1	0	0
13	0	0	1	0	1	1	0	0	1	0	1
14	0	1	1	0	0	1	0	1	1	0	0
15	0	0	1	1	0	1	0	0	1	1	0
16	0	1	1	1	1	1	0	1	1	1	1

FIG. 14B

	$N_{pilot} = 7$							$N_{pilot} = 8$							
Bit #	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
4	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
6	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
7	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
11	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
12	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
13	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
14	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
15	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
16	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1

FIG. 14C

N_{pilot}	Pilot bit position #	Corresponding word of lenght 16
5	0	C_1
	1	C_2
	3	C_3
	4	C_4
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
7	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 14D

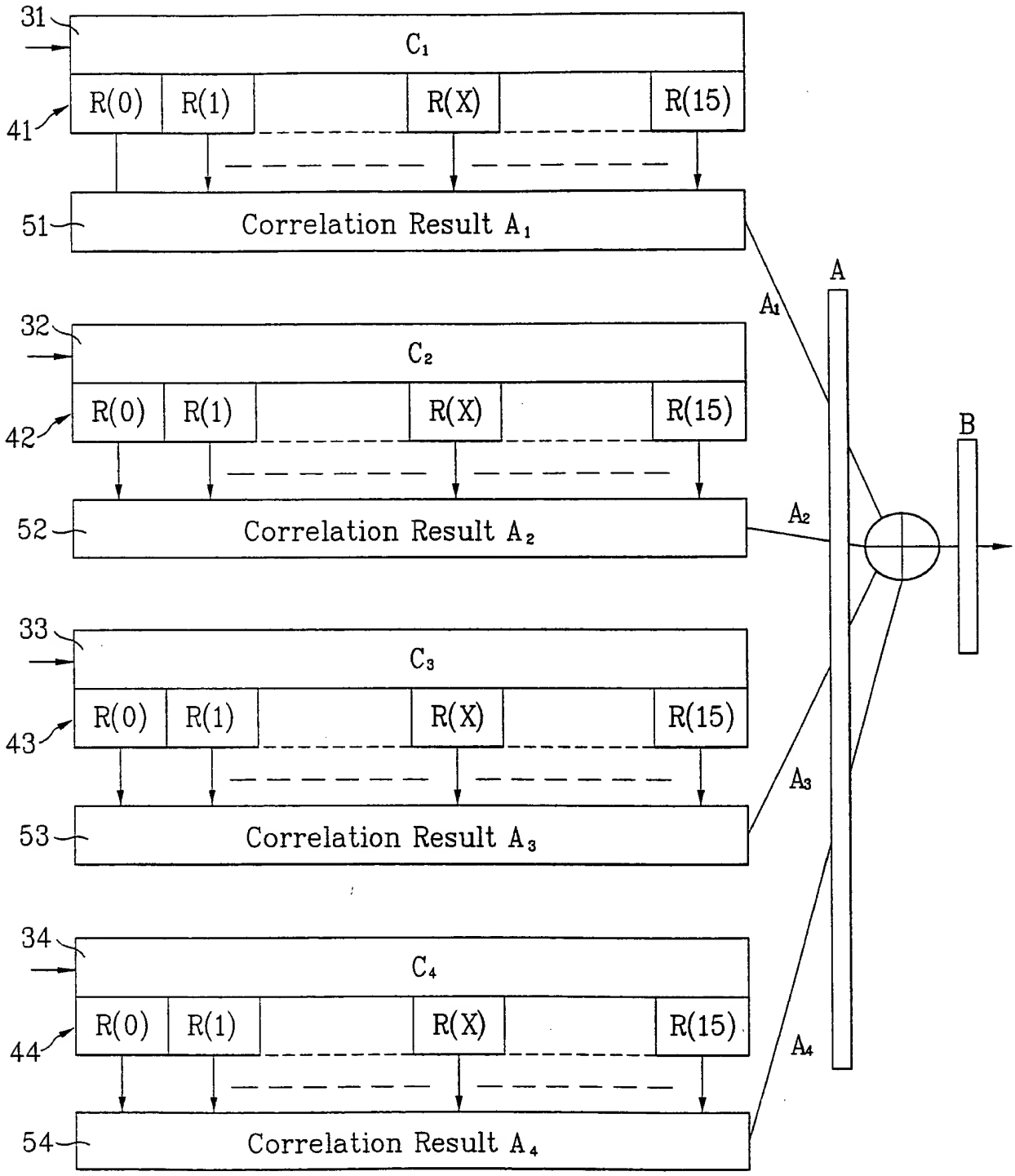
31
C1
41
R(0)
R(1)
R(X)
R(15)
51
Correlation Result A1
32
C2
42
R(0)
R(1)
R(X)
R(15)
52
Correlation Result A2
33
C3
43
R(0)
R(1)
R(X)
R(15)
53
Correlation Result A3
34
C4
44
R(0)
R(1)
R(X)
R(15)
54
Correlation Result A4
A
A1
A2
A3
A4
B

FIG. 14E

	$R_x(0)$	$R_x(1)$	$R_x(2)$	$R_x(3)$	$R_x(4)$	$R_x(5)$	$R_x(6)$	$R_x(7)$	$R_x(8)$	$R_x(9)$	$R_x(10)$	$R_x(11)$	$R_x(12)$	$R_x(13)$	$R_x(14)$	$R_x(15)$
A_1 POINT	16	4	0	4	0	−4	0	−4	−16	−4	0	−4	0	4	0	4
A_2 POINT	16	−4	0	−4	0	4	0	4	−16	4	0	4	0	−4	0	−4
A_3 POINT	16	4	0	4	0	−4	0	−4	−16	−4	0	−4	0	4	0	4
A_4 POINT	16	−4	0	−4	0	4	0	4	−16	4	0	4	0	−4	0	−4
B POINT	64	0	0	0	0	0	0	0	−64	0	0	0	0	0	0	0

FIG. 14F

	$R_x(0)$	$R_x(1)$	$R_x(2)$	$R_x(3)$	$R_x(4)$	$R_x(5)$	$R_x(6)$	$R_x(7)$	$R_x(8)$	$R_x(9)$	$R_x(10)$	$R_x(11)$	$R_x(12)$	$R_x(13)$	$R_x(14)$	$R_x(15)$
A_1 POINT + A_2 POINT	32	0	0	0	0	0	0	0	−32	0	0	0	0	0	0	0
A_3 POINT + A_4 POINT	32	0	0	0	0	0	0	0	−32	0	0	0	0	0	0	0
A_1 POINT + A_4 POINT	32	0	0	0	0	0	0	0	−32	0	0	0	0	0	0	0
A_2 POINT + A_3 POINT	32	0	0	0	0	0	0	0	−32	0	0	0	0	0	0	0

FIG. 14G

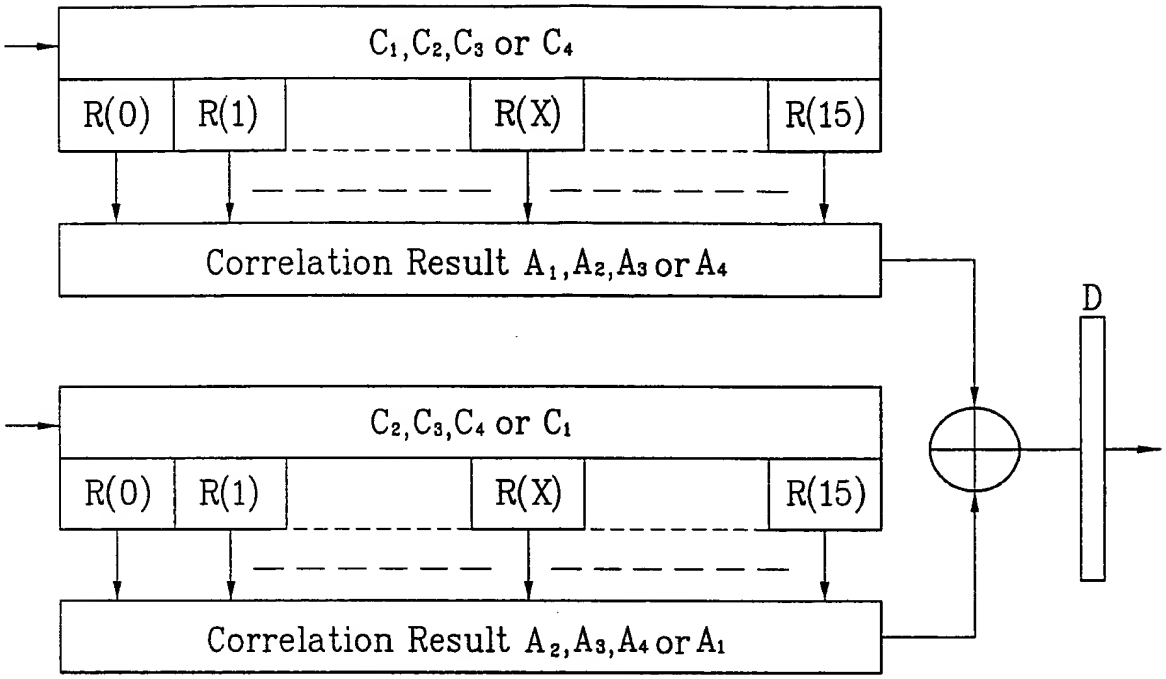

FIG. 14H

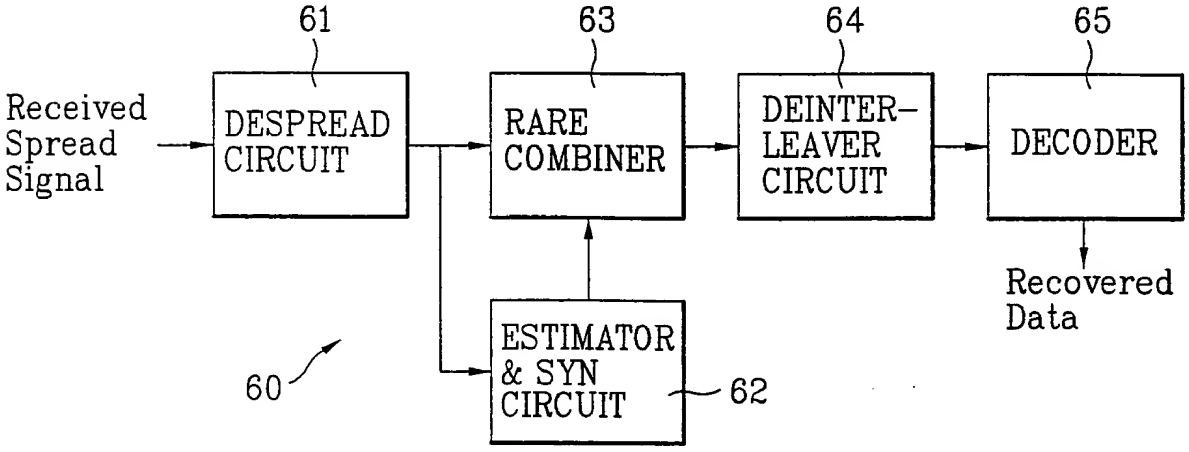

FIG. 14I

	$R_x(0)$	$R_x(1)$	$R_x(2)$	$R_x(3)$	$R_x(4)$	$R_x(5)$	$R_x(6)$	$R_x(7)$	$R_x(8)$	$R_x(9)$	$R_x(10)$	$R_x(11)$	$R_x(12)$	$R_x(13)$	$R_x(14)$	$R_x(15)$
A_1 POINT	16	−4	−4	8	0	−4	0	0	−4	0	0	−4	0	8	−4	−4
A_2 POINT	16	0	0	−4	−4	−4	0	0	12	0	0	−4	−4	−4	0	0
A_3 POINT	16	4	0	0	4	8	8	0	0	0	8	8	4	0	0	4
A_4 POINT	16	0	4	−4	0	0	−4	4	0	4	−4	0	0	−4	4	0
B POINT	64	0	0	0	0	0	4	4	8	4	4	0	0	0	0	0

FIG. 14J

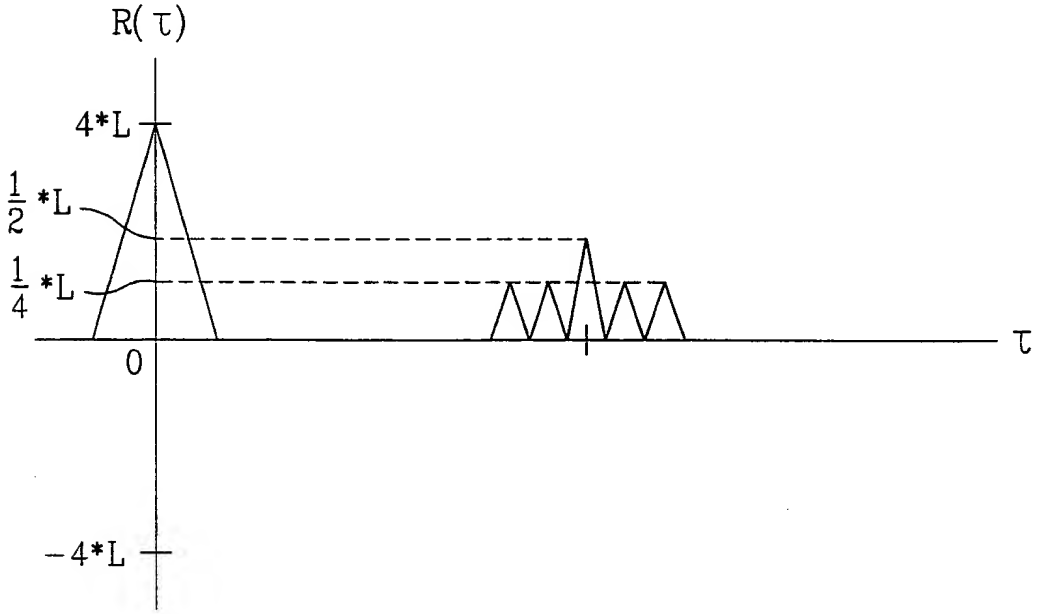

FIG. 15A

	$N_{pilot}=4$		$N_{pilot}=8$				$N_{pilot}=16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 15B

Symbol rate	Symbol #	Channel	Corresponding word of length L=16
$N_{pilot}=4$	1	I-CH	C_1
		Q-CH	C_2
$N_{pilot}=8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{pilot}=16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 15C

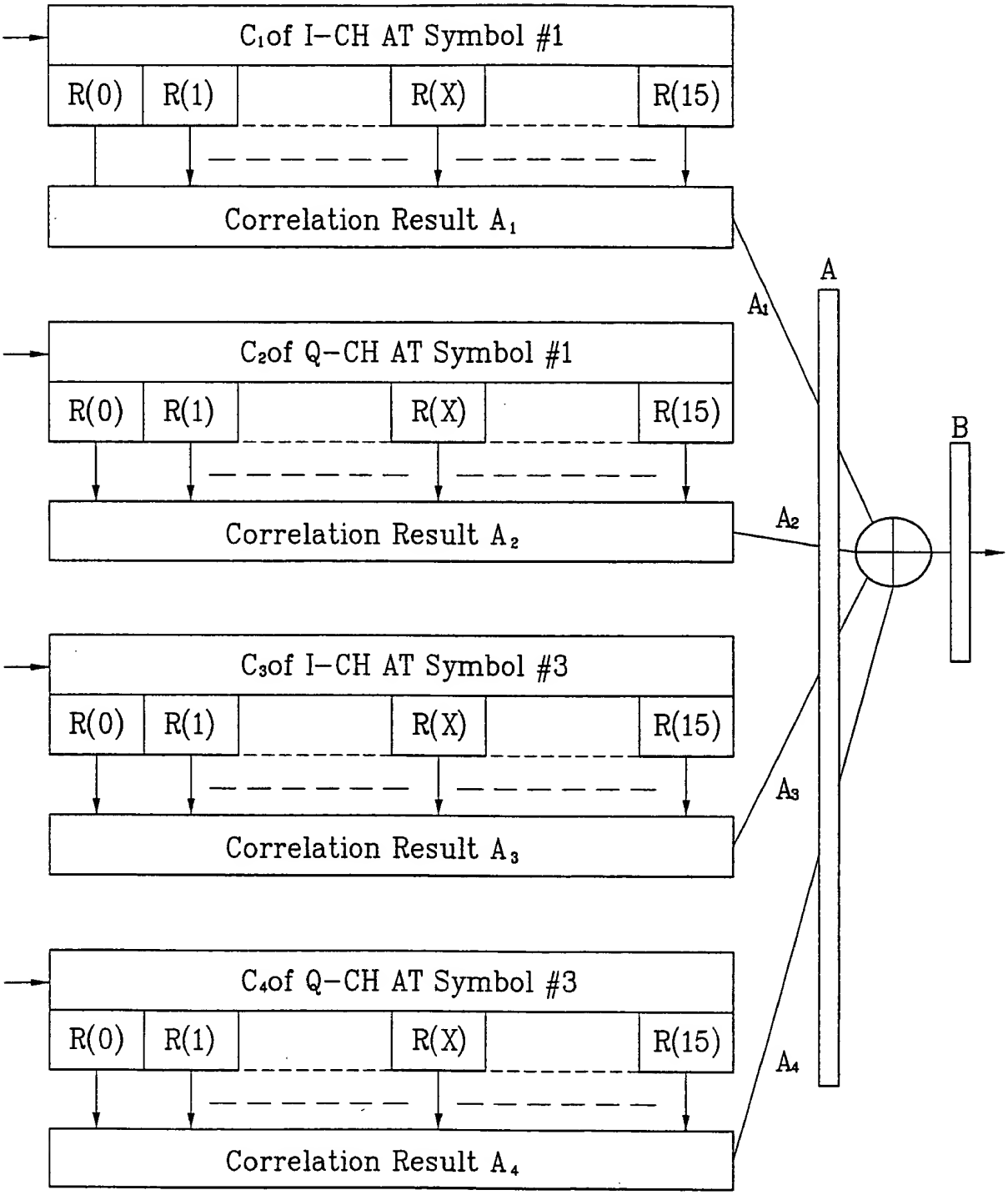
C1of I-CH AT Symbol #1
R(0)
R(1)
R(X)
R(15)
Correlation Result A1
C2of Q-CH AT Symbol #1
R(0)
R(1)
R(X)
R(15)
Correlation Result A2
C3of I-CH AT Symbol #3
R(0)
R(1)
R(X)
R(15)
Correlation Result A3
C4of Q-CH AT Symbol #3
R(0)
R(1)
R(X)
R(15)
Correlation Result A4
A1
A2
A3
A4
A
B

FIG. 16A

Symblo #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	01
4	11	10	11	11
5	11	11	11	10
6	11	10	11	11
7	11	11	11	01
8	11	10	11	00
9	11	00	11	01
10	11	01	11	00
11	11	11	11	10
12	11	01	11	00
13	11	00	11	01
14	11	01	11	00
15	11	00	11	10
16	11	01	11	11

FIG. 16B

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C_1
	Q-CH	C_2
3	I-CH	C_3
	Q-CH	C_4

FIG. 16C

Symblo rate	$N_{pilot}=8$				$N_{pilot}=1$							
Symblo #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 16D

Symbol rate	Symbol #	Channel	Corresponding word of length L=16
$N_{pilot}=8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{pilot}=16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 17A

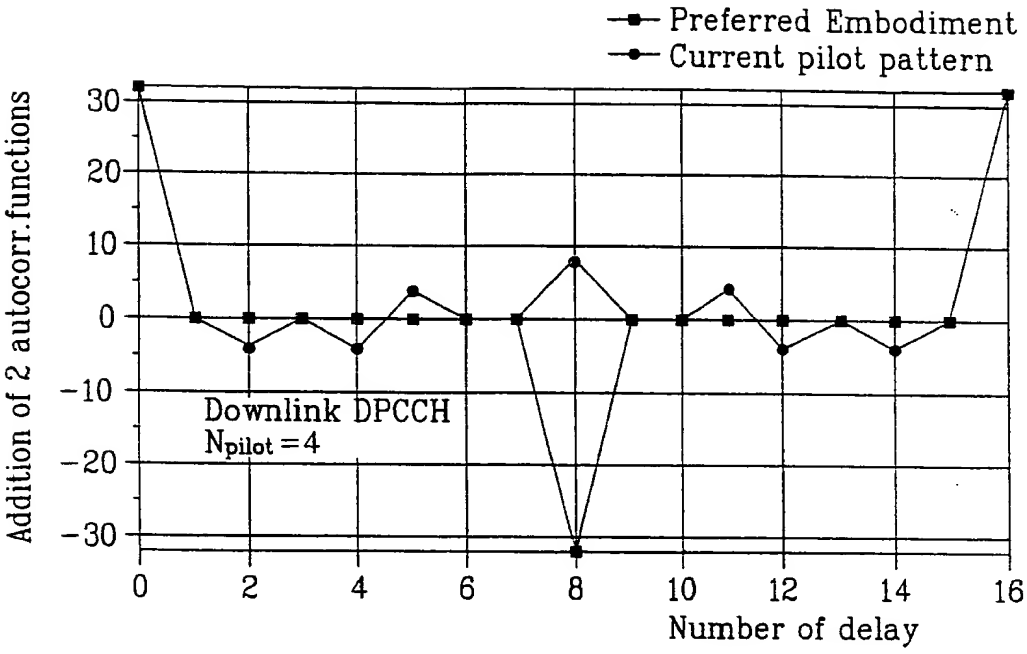

FIG. 17B

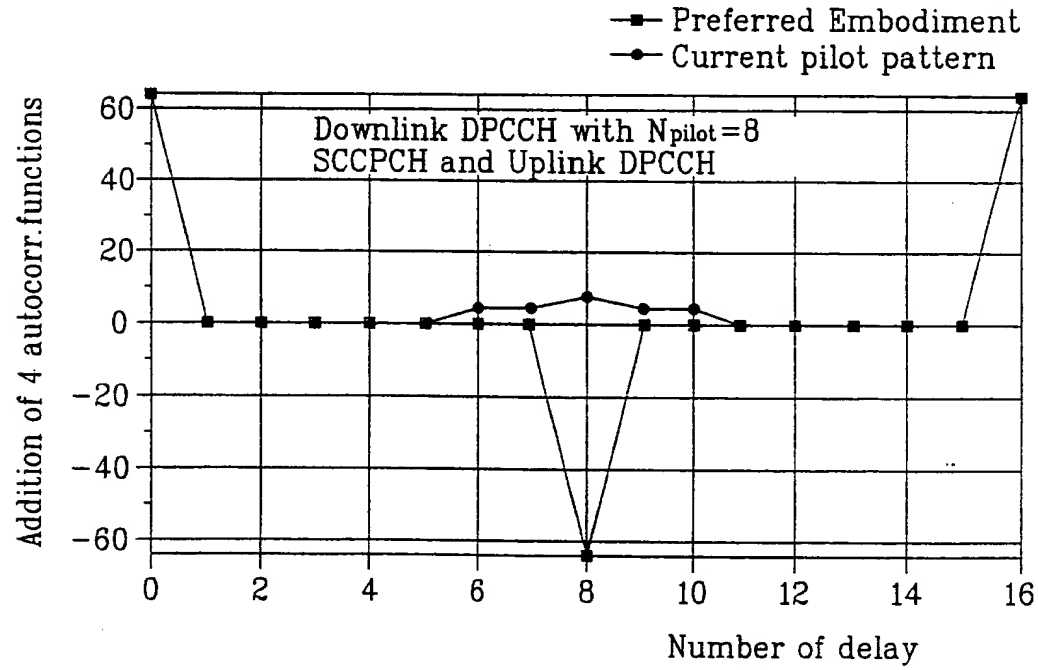

FIG. 17C

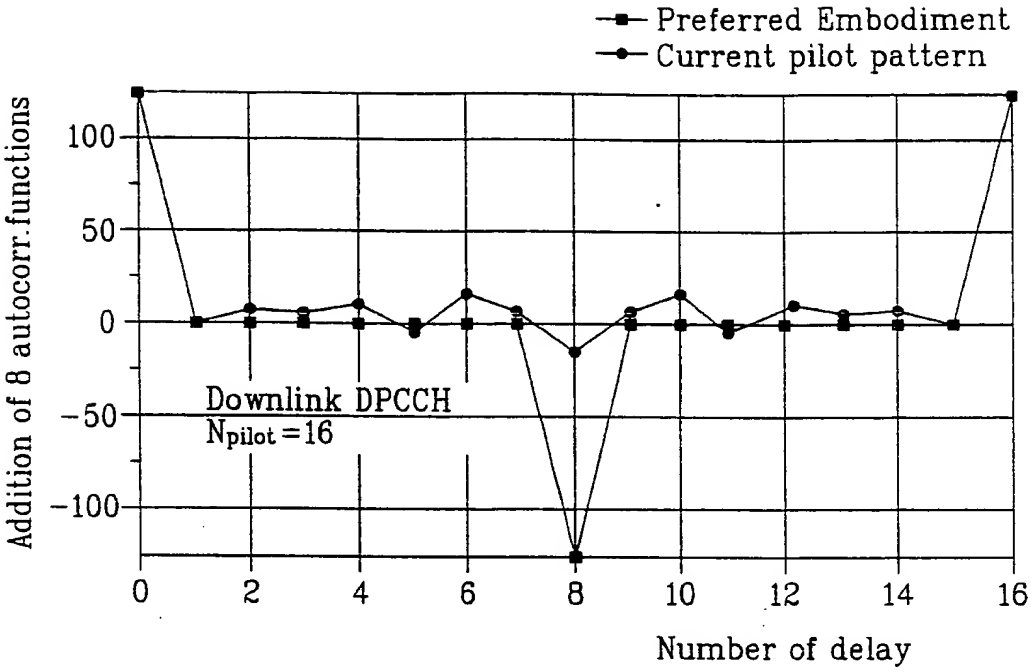

FIG. 18A

Parameters	Downlink
Slot per frame	16
Number of bits in the DPCCH (Pilot/TPC/TFCI)	4/2/0
Number of bits in the DPDCH per each slot	4
Spreding factor (DPDCH)	512
Spreding factor (DPCCH)	512
Modulation	QPSK
3dB bandwidth	4.096MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propogation channel	AWGN

FIG. 18B

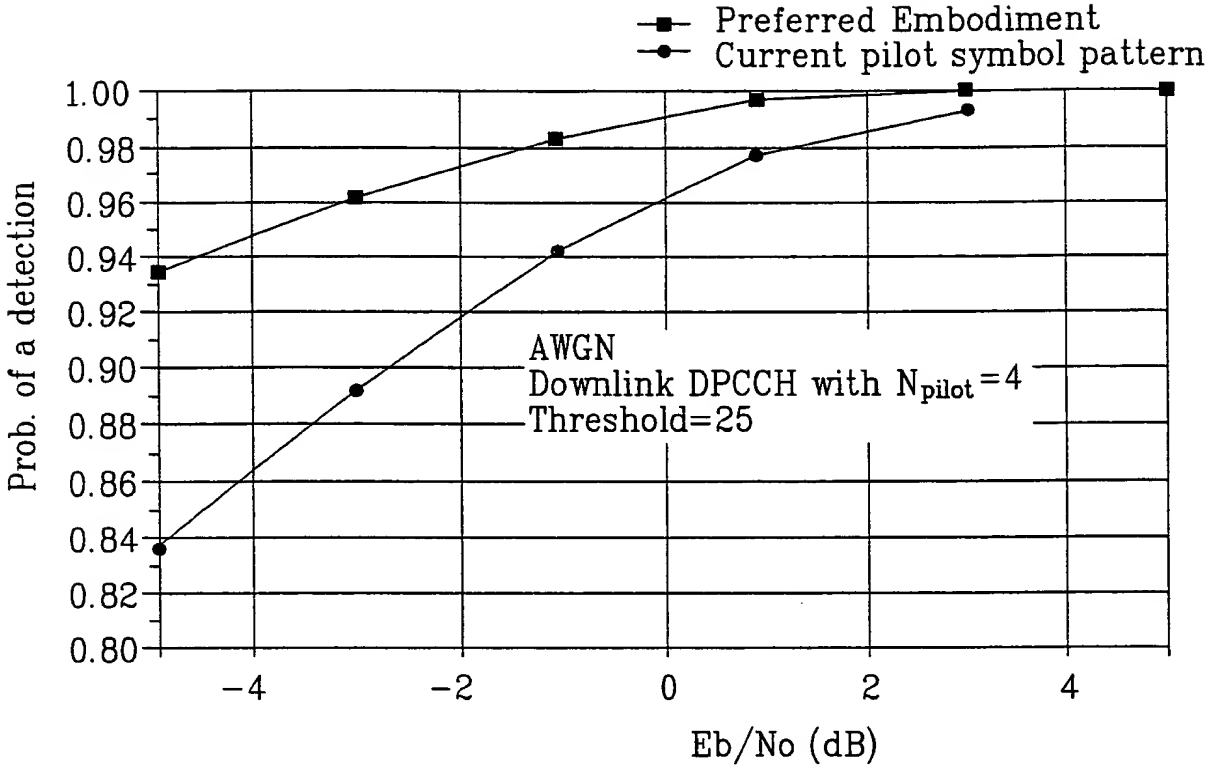

FIG. 18C

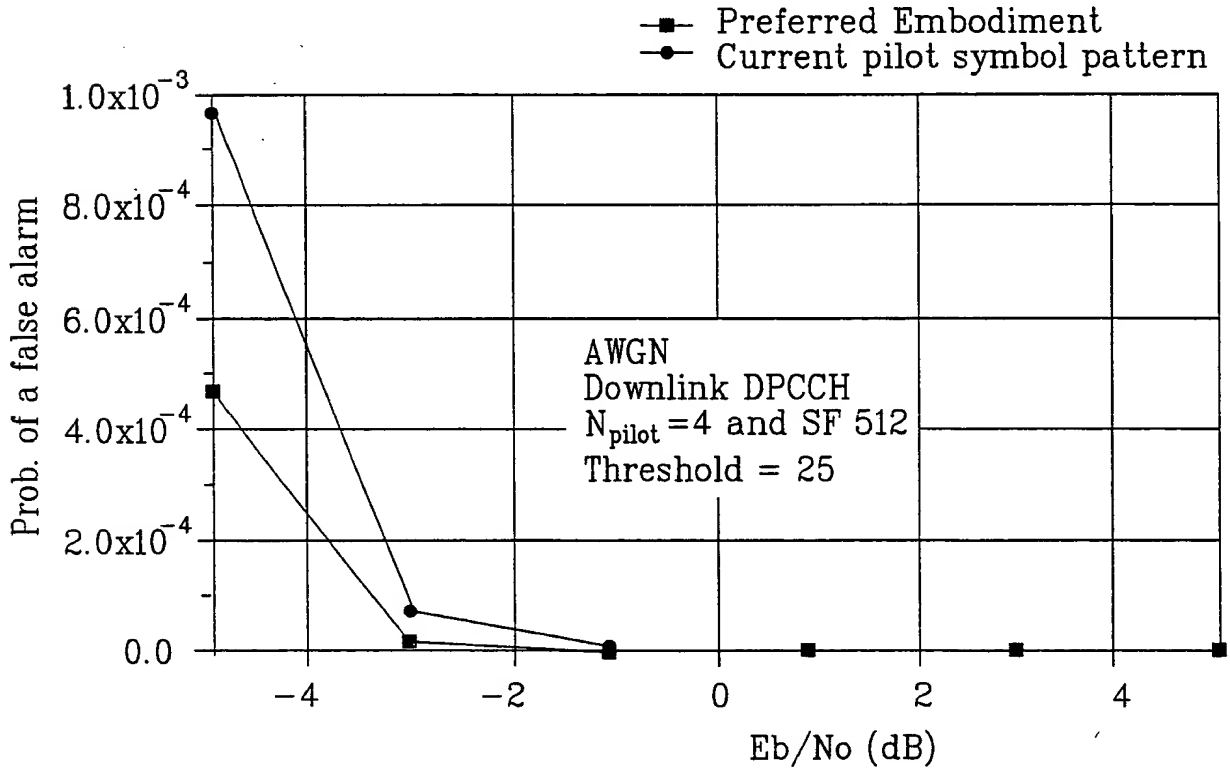

FIG. 18D

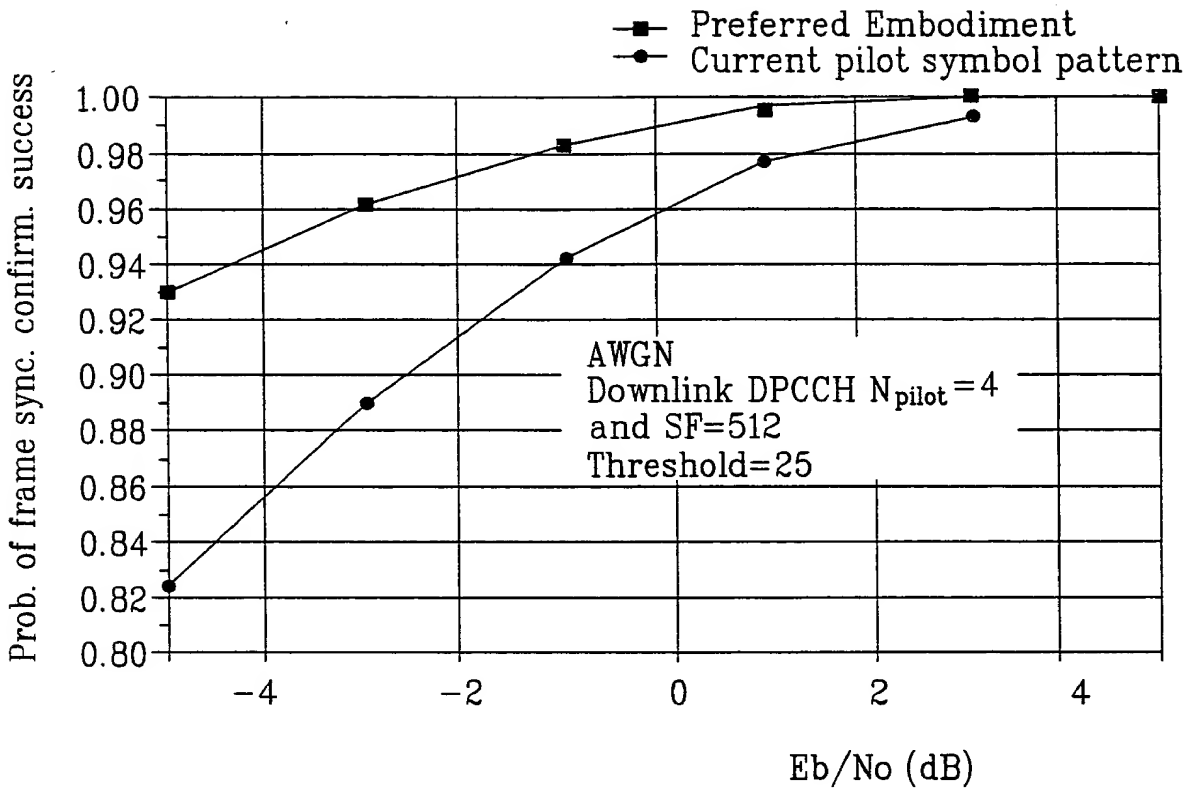
Preferred Embodiment
Current pilot symbol pattern
Prob. of frame sync. confirm. success
1.00
0.98
0.96
0.94
0.92
0.90
0.88
0.86
0.84
0.82
0.80
AWGN
Downlink DPCCH N_{pilot}=4
and SF=512
Threshold=25
−4
−2
0
2
4
Eb/No (dB)

FIG. 19A

	$N_{pilot} = 4$		$N_{pilot} = 8$				$N_{pilot} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	11	00	10
2	00	10	11	01	00	11	11	01	00	11	11	01	00	00
3	10	10	11	11	00	01	11	11	00	01	11	11	00	10
4	00	10	11	01	00	11	11	01	00	11	11	10	00	11
5	01	10	11	00	00	10	11	00	00	10	11	11	00	01
6	00	10	11	01	00	11	11	01	00	11	11	10	00	00
7	01	10	11	11	00	10	11	11	00	10	11	00	00	01
8	00	10	11	10	00	11	11	10	00	11	11	01	00	00
9	10	10	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	11	10	00	00	11	10	00	00	11	10	00	11
11	01	10	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	11	10	00	00	11	10	00	00	11	01	00	00
13	10	10	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	11	10	00	00	11	10	00	00	11	01	00	11
15	10	10	11	00	00	01	11	00	00	01	11	11	00	10
16	11	10	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19B

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{pilot} = 4$	0	I – CH	$-C_1$
		Q – CH	C_2
$N_{pilot} = 8$	1	I – CH	$-C_3$
		Q – CH	C_4
	3	I – CH	C_1
		Q – CH	$-C_2$
$N_{pilot} = 16$	1	I – CH	$-C_3$
		Q – CH	C_4
	3	I – CH	C_1
		Q – CH	$-C_2$
	5	I – CH	$-C_7$
		Q – CH	C_8
	7	I – CH	C_5
		Q – CH	$-C_6$

FIG. 19C

Symbol #	0	1	2	3
Slot #1	11	11	00	01
2	11	10	00	00
3	11	00	00	10
4	11	10	00	00
5	11	11	00	01
6	11	10	00	00
7	11	11	00	10
8	11	10	00	11
9	11	00	00	10
10	11	01	00	11
11	11	11	00	01
12	11	01	00	11
13	11	00	00	10
14	11	01	00	11
15	11	00	00	01
16	11	01	00	00

FIG. 19D

Symbol rate	Channel	Corresponding word of length 16
1	I – CH	C_1
	Q – CH	C_2
3	I – CH	$-C_3$
	Q – CH	$-C_4$

FIG. 19E

	$N_{pilot} = 8$				$N_{pilot} = 16$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	11	00	10
2	11	01	00	11	11	01	00	11	11	01	00	00
3	11	11	00	01	11	11	00	01	11	11	00	10
4	11	01	00	11	11	01	00	11	11	10	00	11
5	11	00	00	10	11	00	00	10	11	11	00	01
6	11	01	00	11	11	01	00	11	11	10	00	00
7	11	11	00	10	11	11	00	10	11	00	00	01
8	11	10	00	11	11	10	00	11	11	01	00	00
9	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	00	00	11	10	00	00	11	10	00	11
11	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	00	00	11	10	00	00	11	01	00	00
13	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	00	00	11	10	00	00	11	01	00	11
15	11	00	00	01	11	00	00	01	11	11	00	10
16	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19F

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{pilot} = 8$	1	I – CH	$-C_3$
		Q – CH	C_4
	3	I – CH	C_1
		Q – CH	$-C_2$
$N_{pilot} = 16$	1	I – CH	$-C_3$
		Q – CH	C_4
	3	I – CH	C_1
		Q – CH	$-C_2$
	5	I – CH	$-C_7$
		Q – CH	C_8
	7	I – CH	C_5
		Q – CH	$-C_6$

FIG. 20A

Sequence	Autocorrelation
C_1= (1 1 0 1 1 1 1 1 0 0 1 0 0 0 0 0)	16 4 0 4 0 −4 0 −4 −16 −4 0 −4 0 4 0 4
C_2= (1 0 0 0 1 0 1 0 0 1 1 1 0 1 0 1)	16 −4 0 −4 0 4 0 4 −16 4 0 4 0 −4 0 −4
C_3= (1 1 1 1 1 0 1 1 0 0 0 0 0 1 0 0)	16 4 0 4 0 −4 0 −4 −16 −4 0 −4 0 4 0 4
C_4= (0 1 0 1 0 0 0 1 1 0 1 0 1 1 1 0)	16 −4 0 −4 0 4 0 4 −16 4 0 4 0 −4 0 −4
C_5= (0 0 1 1 1 0 1 1 1 1 0 0 0 1 0 0)	16 4 0 −4 0 4 0 −4 −16 −4 0 4 0 −4 0 4
C_6= (0 0 1 0 0 1 0 1 1 1 0 1 1 0 1 0)	16 −4 0 4 0 −4 0 4 −16 4 0 −4 0 4 0 −4
C_7= (0 1 1 1 0 0 0 0 1 0 0 0 1 1 1 1)	16 4 0 −4 0 4 0 −4 −16 −4 0 4 0 −4 0 4
C_8= (1 0 1 1 1 0 1 0 0 1 0 0 0 1 0 1)	16 −4 0 4 0 −4 0 4 −16 4 0 −4 0 4 0 −4
C_9= (0 0 1 1 0 1 1 1 1 1 0 0 1 0 0 0)	16 4 0 4 0 −4 0 −4 −16 −4 0 −4 0 4 0 4
C_{10}= (0 0 1 0 1 0 0 1 1 1 0 1 0 1 1 0)	16 −4 0 −4 0 4 0 4 −16 4 0 4 0 −4 0 −4
C_{11}= (1 1 0 0 0 0 0 1 0 0 1 1 1 1 1 0)	16 4 0 4 0 −4 0 −4 −16 −4 0 −4 0 4 0 4
C_{12}= (1 0 1 1 1 0 0 1 0 1 0 0 0 1 1 0)	16 −4 0 −4 0 4 0 4 −16 4 0 4 0 −4 0 −4
C_{13}= (0 1 0 0 0 0 1 1 1 0 1 1 1 1 0 0)	16 4 0 −4 0 4 0 −4 −16 −4 0 4 0 −4 0 4
C_{14}= (1 0 0 0 1 0 0 1 0 1 1 1 0 1 1 0)	16 −4 0 4 0 −4 0 4 −16 4 0 −4 0 4 0 −4
C_{15}= (0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1)	16 4 0 −4 0 4 0 −4 −16 −4 0 4 0 −4 0 4
C_{16}= (1 0 0 1 0 0 0 1 0 1 1 0 1 1 1 0)	16 −4 0 4 0 −4 0 4 −16 4 0 −4 0 4 0 −4

FIG. 20B

$R(\tau)$ τ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$	16	4	0	4	0	−4	0	−4	−16	−4	0	−4	0	4	0	4
$R_F(\tau)$	16	−4	0	−4	0	4	0	4	−16	4	0	4	0	−4	0	−4
$R_G(\tau)$	16	4	0	−4	0	4	0	−4	−16	−4	0	4	0	−4	0	4
$R_H(\tau)$	16	−4	0	4	0	−4	0	4	−16	4	0	−4	0	4	0	−4

FIG. 20C

	$N_{pilot} = 6$						$N_{pilot} = 8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	1	0	1	0	1	0	1	1	1	0
4	1	1	0	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	0
6	1	1	0	1	0	0	1	1	1	0	1	0	1	0
7	1	1	1	1	1	0	1	1	1	1	1	1	1	0
8	1	1	0	1	1	1	1	1	1	0	1	1	1	1
9	1	0	0	1	0	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	0	1	1	1	0	1	0
11	1	1	1	1	0	1	1	1	1	1	1	0	1	1
12	1	0	1	1	0	0	1	0	1	1	1	0	1	0
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	0	1	1	1	1	1	0	1	1	1	1	1	1
15	1	0	0	1	0	1	1	0	1	0	1	0	1	1
16	1	0	1	1	0	0	1	0	1	1	1	0	1	0

FIG. 20D

N_{pilots}	Pilot bit position #	Corresponding word of length 16
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 20E

Symbol rate	8ksps		16,32,64,128ksps				256,512,1024ksps							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	10	11	11	11	10	11	00	11	01
2	11	10	11	10	11	11	11	10	11	11	11	00	11	10
3	11	00	11	00	11	10	11	00	11	10	11	11	11	11
4	11	10	11	10	11	11	11	10	11	11	11	10	11	11
5	11	11	11	11	11	10	11	11	11	10	11	10	11	01
6	11	10	11	10	11	00	11	10	11	00	11	01	11	00
7	11	11	11	11	11	10	11	11	11	10	11	10	11	01
8	11	10	11	10	11	11	11	10	11	11	11	11	11	00
9	11	00	11	00	11	01	11	00	11	01	11	11	11	10
10	11	01	11	01	11	00	11	01	11	00	11	11	11	01
11	11	11	11	11	11	01	11	11	11	01	11	00	11	00
12	11	01	11	01	11	00	11	01	11	00	11	01	11	00
13	11	00	11	00	11	01	11	00	11	01	11	01	11	10
14	11	01	11	01	11	11	11	01	11	11	11	10	11	11
15	11	00	11	00	11	01	11	00	11	01	11	01	11	10
16	11	01	11	01	11	00	11	01	11	00	11	00	11	11

FIG. 20F

Symbol rate	2048,4096ksps															
Symbol #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Slot #1	11	11	11	10	11	00	11	01	11	00	11	11	11	01	11	01
2	11	10	11	11	11	00	11	10	11	00	11	10	11	10	11	00
3	11	00	11	10	11	11	11	11	11	11	11	01	11	00	11	00
4	11	10	11	11	11	10	11	11	11	10	11	01	11	00	11	01
5	11	11	11	10	11	10	11	01	11	01	11	01	11	01	11	10
6	11	10	11	00	11	01	11	00	11	10	11	00	11	00	11	00
7	11	11	11	10	11	10	11	01	11	10	11	00	11	10	11	00
8	11	10	11	11	11	11	11	00	11	11	11	11	11	11	11	01
9	11	00	11	01	11	11	11	10	11	11	11	00	11	10	11	10
10	11	01	11	00	11	11	11	01	11	11	11	01	11	01	11	11
11	11	11	11	01	11	00	11	00	11	00	11	10	11	11	11	11
12	11	01	11	00	11	01	11	00	11	01	11	10	11	11	11	10
13	11	00	11	01	11	01	11	10	11	10	11	10	11	10	11	01
14	11	01	11	11	11	10	11	11	11	01	11	11	11	11	11	11
15	11	00	11	01	11	01	11	10	11	01	11	11	11	01	11	11
16	11	01	11	00	11	00	11	11	11	00	11	00	11	00	11	10

FIG. 20G

Symbol rate	Symbol #	Channel	Corresponding word of length 16
8ksps	1	I - CH	C_1
		Q - CH	C_2
16, 32, 64, 128ksps	1	I - CH	C_1
		Q - CH	C_2
	3	I - CH	C_3
		Q - CH	C_4
256, 512, 1024ksps	1	I - CH	C_1
		Q - CH	C_2
	3	I - CH	C_3
		Q - CH	C_4
	5	I - CH	C_5
		Q - CH	C_6
	7	I - CH	C_7
		Q - CH	C_8
2048,4096ksps	1	I - CH	C_1
		Q - CH	C_2
	3	I - CH	C_3
		Q - CH	C_4
	5	I - CH	C_5
		Q - CH	C_6
	7	I - CH	C_7
		Q - CH	C_8
	9	I - CH	C_9
		Q - CH	C_{10}
	11	I - CH	C_{11}
		Q - CH	C_{12}
	13	I - CH	C_{13}
		Q - CH	C_{14}
	15	I - CH	C_{15}
		Q - CH	C_{16}

FIG. 20H

Stmbol #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	10
4	11	10	11	11
5	11	11	11	10
6	11	10	11	00
7	11	11	11	10
8	11	10	11	11
9	11	00	11	01
10	11	01	11	00
11	11	11	11	01
12	11	01	11	00
13	11	00	11	01
14	11	01	11	11
15	11	00	11	01
16	11	01	11	00

FIG. 20I

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C_1
	Q-CH	C_2
3	I-CH	C_3
	Q-CH	C_4

FIG. 21

Frame Synchronization Words	
L=15 , Slot No.	1 2 3 4 15
	C_1 = (1 0 0 0 1 1 1 1 0 1 0 1 1 0 0)
	C_2 = (1 0 1 0 0 1 1 0 1 1 1 0 0 0 0)
	C_3 = (1 1 0 0 0 1 0 0 1 1 0 1 0 1 1)
	C_4 = (0 0 1 0 1 0 0 0 0 1 1 1 0 1 1)
	C_5 = (1 1 1 0 1 0 1 1 0 0 1 0 0 0 1)
	C_6 = (1 1 0 1 1 1 0 0 0 0 1 0 1 0 0)
	C_7 = (1 0 0 1 1 0 1 0 1 1 1 1 0 0 0)
	C_8 = (0 0 0 0 1 1 1 0 1 1 0 0 1 0 1)

FIG. 22A

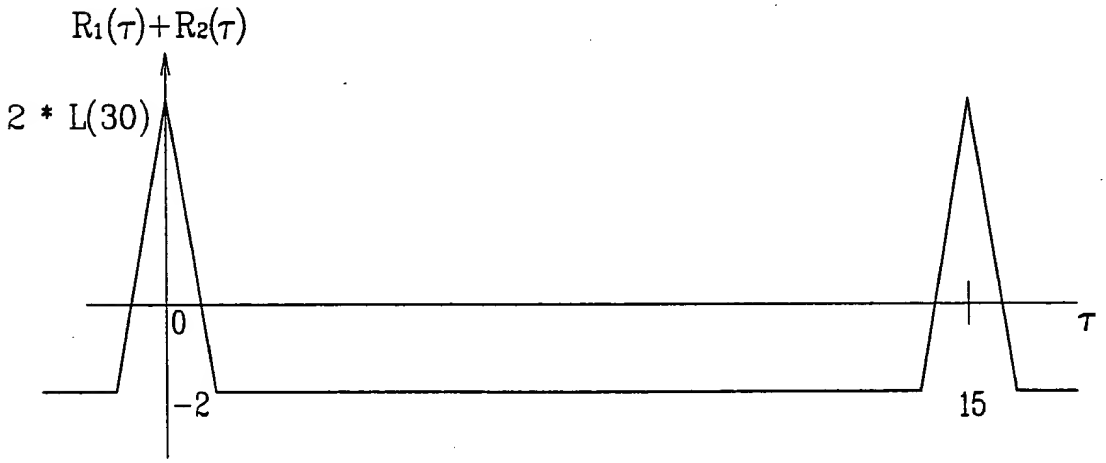

FIG. 22B

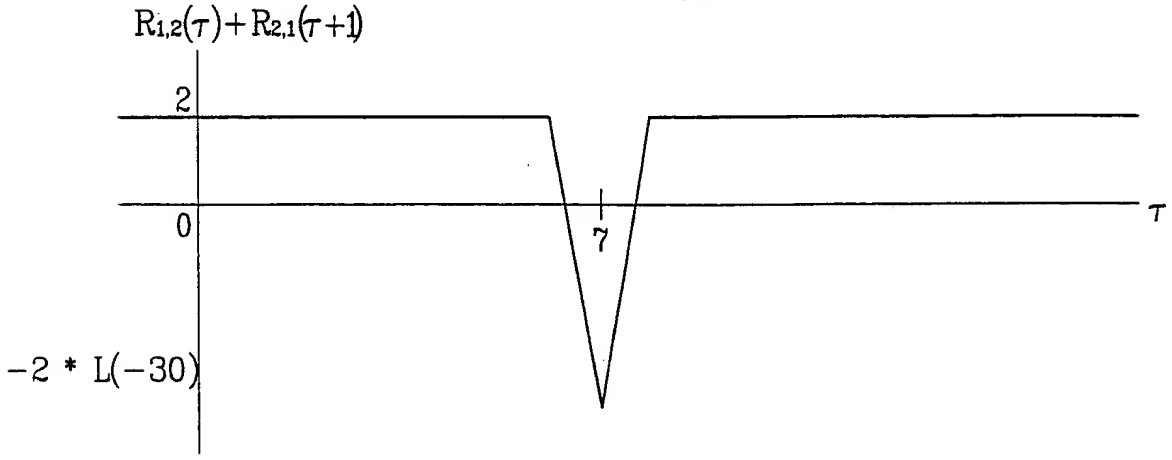

FIG. 22C

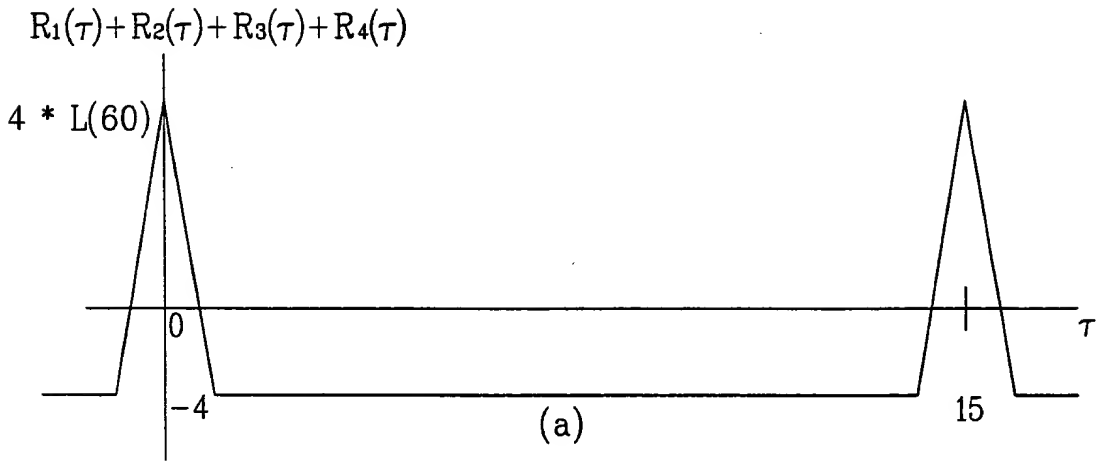

FIG. 22D

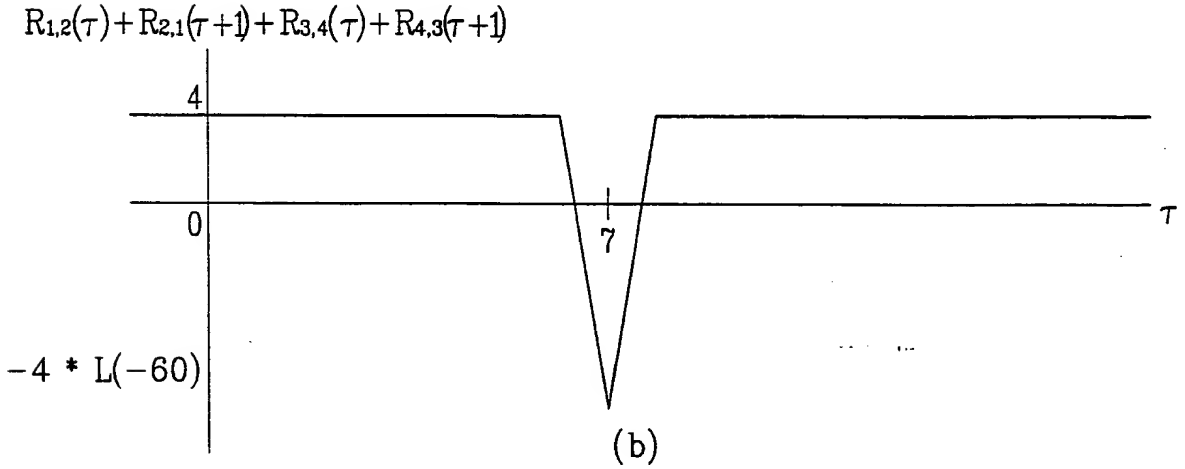

FIG. 23A

	$N_{pilot} = 2$		$N_{pilot} = 3$			$N_{pilot} = 4$			
Bit #	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	0	1	0
3	0	1	0	1	1	1	0	1	1
4	0	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	0	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	0	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	0	0	0	1	0	1	0	1	0
15	0	0	0	1	0	1	0	1	0

FIG. 23B

N_{pilot}	Pilot bit position #	Corresponding word of length 15
2	0	C_1
	1	C_2
3	0	C_1
	2	C_2
4	1	C_1
	3	C_2

FIG. 23C

	$N_{pilot} = 2$		$N_{pilot} = 3$			$N_{pilot} = 4$			
Bit #	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	1	0	0	1	0	1	0	1	0
3	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	1	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	1	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	1	0	0	1	0	1	0	1	0
15	1	0	0	1	0	1	0	1	0

FIG. 23D

N_{pilot}	Pilot bit position #	Corresponding word of length 15
2	1	C_1
3	0	C_1
	2	C_2
4	1	C_1
	3	C_2

FIG. 23E

	$N_{pilot} = 5$					$N_{pilot} = 6$					
Bit #	0	1	2	3	4	0	1	2	3	4	5
Slot #1	1	1	1	1	0	1	1	1	1	1	0
2	0	0	1	1	0	1	0	0	1	1	0
3	0	1	1	0	1	1	0	1	1	0	1
4	0	0	1	0	0	1	0	0	1	0	0
5	1	0	1	0	1	1	1	0	1	0	1
6	1	1	1	1	0	1	1	1	1	1	0
7	1	1	1	0	0	1	1	1	1	0	0
8	1	0	1	0	0	1	1	0	1	0	0
9	0	1	1	1	0	1	0	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1
11	0	1	1	0	1	1	0	1	1	0	1
12	1	0	1	1	1	1	1	0	1	1	1
13	1	0	1	0	0	1	1	0	1	0	0
14	0	0	1	1	1	1	0	0	1	1	1
15	0	0	1	1	1	1	0	0	1	1	1

FIG. 23F

	N_{pilot} 7							$N_{pilot} = 8$							
Bit #	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
2	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
3	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	0	1	1	0	1	0	1	0	1	0
5	1	1	0	1	0	1	1	1	1	1	0	1	0	1	1
6	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
7	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	1	1	1	0	1	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
12	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
13	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
14	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1
15	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1

FIG. 23G

N_{pilot}	Pilot bit position #	Corresponding word of length 15
5	0	C_1
	1	C_2
	3	C_3
	4	C_4
6	1	C_1
	2	C_2
	4	C_3
	5	C_4
7	1	C_1
	2	C_2
	4	C_3
	5	C_4
8	1	C_1
	3	C_2
	5	C_3
	7	C_4

FIG. 23H

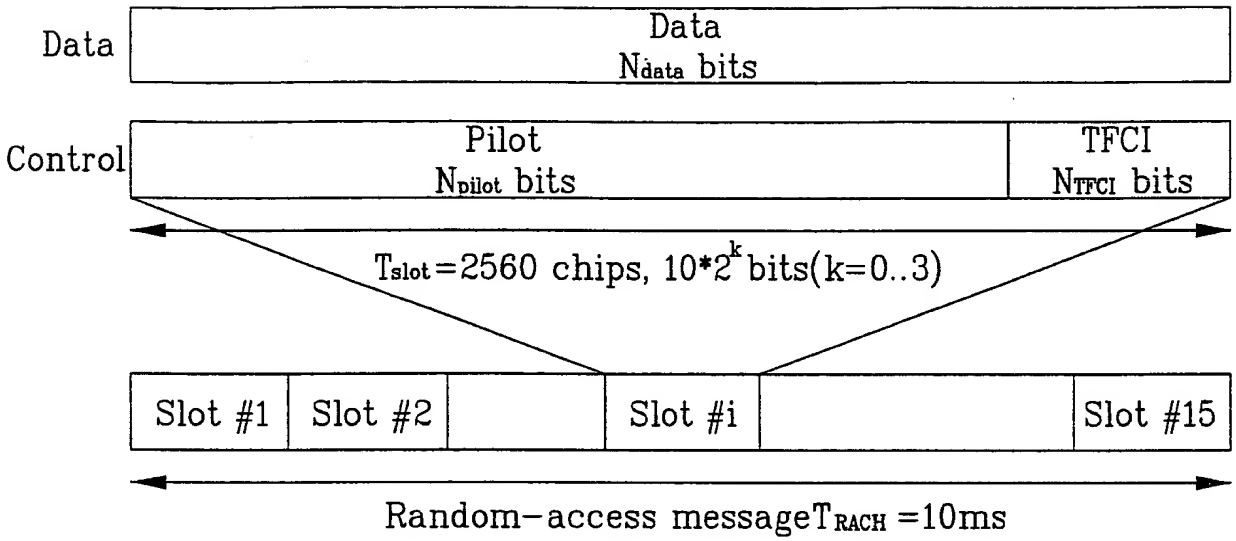

FIG. 23I

Channel Bit Rate(kbps)	Channel Symbol Rate(ksps)	SF	Bits/ Frame	Bits/ Slot	N_{pilot}	N_{TFCI}
15	15	256	150	10	8	2

FIG. 23J

Bit #	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	1	1	0
2	1	0	1	0	1	1	1	0
3	1	0	1	1	1	0	1	1
4	1	0	1	0	1	0	1	0
5	1	1	1	0	1	0	1	1
6	1	1	1	1	1	1	1	0
7	1	1	1	1	1	0	1	0
8	1	1	1	0	1	0	1	0
9	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1
11	1	0	1	1	1	0	1	1
12	1	1	1	0	1	1	1	1
13	1	1	1	0	1	0	1	0
14	1	0	1	0	1	1	1	1
15	1	0	1	0	1	1	1	1

FIG. 24A

	$N_{pilot} = 2$	$N_{pilot} = 4$		$N_{pilot} = 8$				$N_{pilot} = 16$							
Symbol #	0	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	11	10	11	11	11	10	11	11	11	10
2	00	11	00	11	00	11	10	11	00	11	10	11	11	11	00
3	01	11	01	11	01	11	01	11	01	11	01	11	10	11	00
4	00	11	00	11	00	11	00	11	00	11	00	11	01	11	10
5	10	11	10	11	10	11	01	11	10	11	01	11	11	11	11
6	11	11	11	11	11	11	10	11	11	11	10	11	01	11	01
7	11	11	11	11	11	11	00	11	11	11	00	11	10	11	11
8	10	11	10	11	10	11	00	11	10	11	00	11	10	11	00
9	01	11	01	11	01	11	10	11	01	11	10	11	00	11	11
10	11	11	11	11	11	11	11	11	11	11	11	11	00	11	11
11	01	11	01	11	01	11	01	11	01	11	01	11	11	11	10
12	10	11	10	11	10	11	11	11	10	11	11	11	00	11	10
13	10	11	10	11	10	11	00	11	10	11	00	11	01	11	01
14	00	11	00	11	00	11	11	11	00	11	11	11	00	11	00
15	00	11	00	11	00	11	11	11	00	11	11	11	10	11	01

FIG. 24B

Symbol rate	Symbol	Channel	Corresponding word of length 15
$N_{pilot} = 2$	0	I-CH	C_1
		Q-CH	C_2
$N_{pilot} = 4$	1	I-CH	C_1
		Q-CH	C_2
$N_{pilot} = 8$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
$N_{pilot} = 16$	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 24C

	N_{pilot} = 4		N_{pilot} = 8				N_{pilot} = 16							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	00	00	10
2	10	10	11	00	00	01	11	00	00	01	11	10	00	10
3	11	10	11	11	00	00	11	11	00	00	11	10	00	11
4	10	10	11	10	00	01	11	10	00	01	11	00	00	00
5	00	10	11	11	00	11	11	11	00	11	11	01	00	10
6	01	10	11	00	00	10	11	00	00	10	11	11	00	00
7	01	10	11	10	00	10	11	10	00	10	11	01	00	11
8	00	10	11	10	00	11	11	10	00	11	11	10	00	11
9	11	10	11	00	00	00	11	00	00	00	11	01	00	01
10	01	10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	10	11	11	00	00	11	11	00	00	11	00	00	10
12	00	10	11	01	00	11	11	01	00	11	11	00	00	01
13	00	10	11	10	00	11	11	10	00	11	11	11	00	00
14	10	10	11	01	00	01	11	01	00	01	11	10	00	01
15	10	10	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 24D

Symbol rate	Symbol #	Channel	Corresponding word of length 15
N_{pilot} = 4	0	I-CH	$-C_1$
		Q-CH	C_2
N_{pilot} = 8	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
N_{pilot} = 16	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_8
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 25A

	N_{pilot} = 8				N_{pilot} = 16							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	10
2	11	00	11	10	11	00	11	10	11	11	11	00
3	11	01	11	01	11	01	11	01	11	10	11	00
4	11	00	11	00	11	00	11	00	11	01	11	10
5	11	10	11	01	11	10	11	01	11	11	11	11
6	11	11	11	10	11	11	11	10	11	01	11	01
7	11	11	11	00	11	11	11	00	11	10	11	11
8	11	10	11	00	11	10	11	00	11	10	11	00
9	11	01	11	10	11	01	11	10	11	00	11	11
10	11	11	11	11	11	11	11	11	11	00	11	11
11	11	01	11	01	11	01	11	01	11	11	11	10
12	11	10	11	11	11	10	11	11	11	00	11	10
13	11	10	11	00	11	10	11	00	11	01	11	01
14	11	00	11	11	11	00	11	11	11	00	11	00
15	11	00	11	11	11	00	11	11	11	10	11	01

FIG. 25B

Symbol rate	Symbol #	Channel	Corresponding word of length 15
N_{pilot} = 8	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
N_{pilot} = 16	1	I-CH	C_1
		Q-CH	C_2
	3	I-CH	C_3
		Q-CH	C_4
	5	I-CH	C_5
		Q-CH	C_6
	7	I-CH	C_7
		Q-CH	C_8

FIG. 25C

	N_{pilot} = 8				N_{pilot} = 16							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	00	00	10
2	11	00	00	01	11	00	00	01	11	10	00	10
3	11	11	00	00	11	11	00	00	11	10	00	11
4	11	10	00	01	11	10	00	01	11	00	00	00
5	11	11	00	11	11	11	00	11	11	01	00	10
6	11	00	00	10	11	00	00	10	11	11	00	00
7	11	10	00	10	11	10	00	10	11	01	00	11
8	11	10	00	11	11	10	00	11	11	10	00	11
9	11	00	00	00	11	00	00	00	11	01	00	01
10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	11	00	00	11	11	00	00	11	00	00	10
12	11	01	00	11	11	01	00	11	11	00	00	01
13	11	10	00	11	11	10	00	11	11	11	00	00
14	11	01	00	01	11	01	00	01	11	10	00	01
15	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 25D

Symbol rate	Symbol #	Channel	Corresponding word of length 15
N_{pilot} = 8	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	C_2
N_{pilot} = 16	1	I-CH	$-C_3$
		Q-CH	C_4
	3	I-CH	C_1
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	C_8
	7	I-CH	C_5
		Q-CH	$-C_6$

FIG. 26A

Parameters	Uplink
Number of slots per frame	15
Number of bits in the DPCCH(Pilot/TPC/TFCI/FBI)	6/2/2/0
Number of bits in the DPDCH per each slot	10
Spreading factor (DPDCH)	256
Spreading factor (DPCCH)	256
Modulation	HPSK
3dB bandwidth	3.84MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propagation channel	AWGN

FIG. 26B

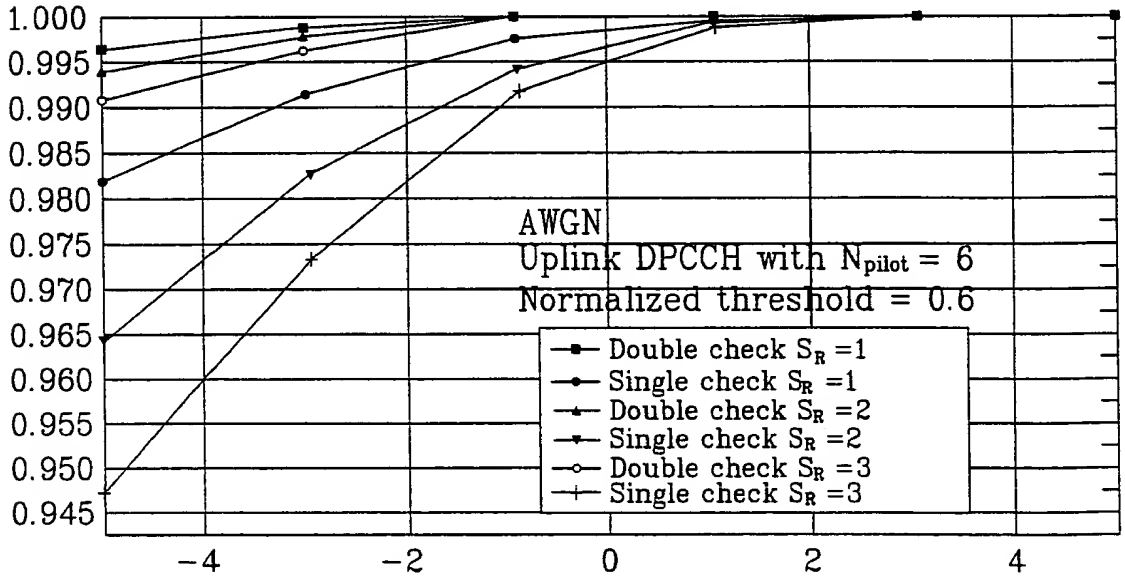

FIG. 26C

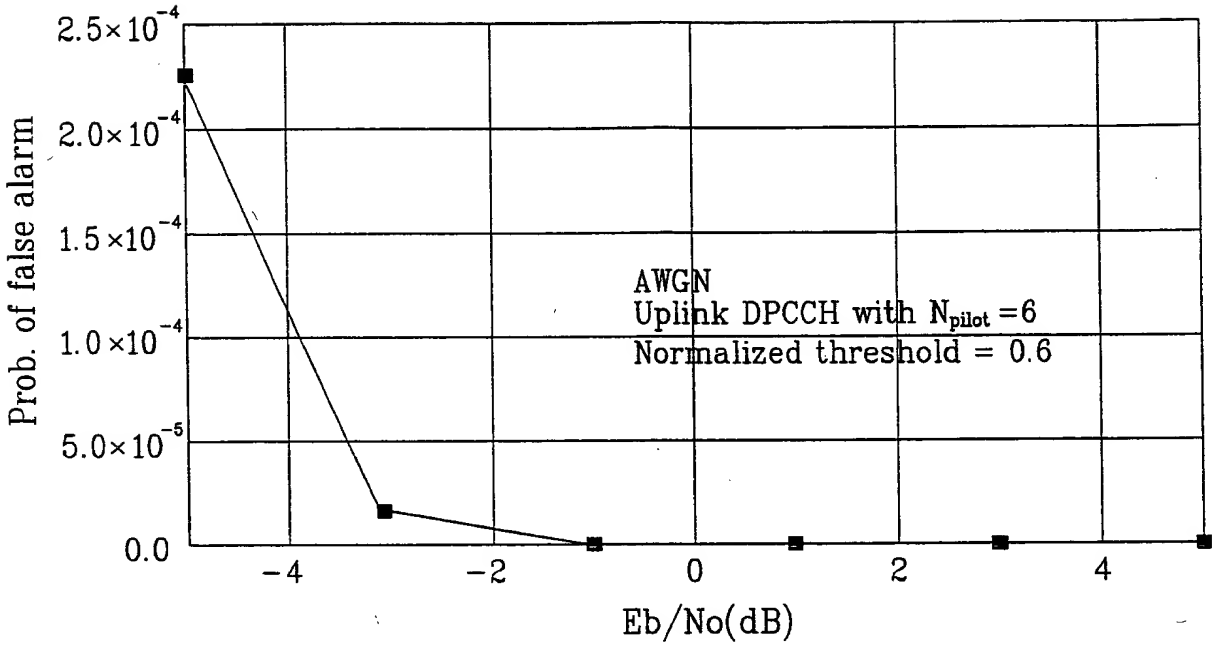
2.5×10^-4
2.0×10^-4
1.5×10^-4
1.0×10^-4
5.0×10^-5
0.0
Prob. of false alarm
AWGN
Uplink DPCCH with N_pilot =6
Normalized threshold = 0.6
−4
−2
0
2
4
Eb/No(dB)

FIG. 27

Item	15 slots	16 slots
No. of slots per frame	15	16
No. of N_{pilot} per slot	1)Uplink 2,3,4,5,6,7,8 2)Downlink 2,4,8,16	1)Uplink 5,6,7,8 2)Downlink 4,8,16,32
Slot-Slot possible?	Yes	Yes
Double-check possible?	Yes (Two correltors such as auto-correlator and cross-correlator are used)	Yes (Auto-correlator)
Single frame synchronization word can be used for frame synchronization?	Yes since a frame synchronization word has-1 out of-phase coefficients	May not be feasible because of +4 or -4 out-of-phase coefficients. The +4 or -4 side lobes can be zero through some particular processing using preferred pair of frame synchronization words.
Frame synchronization words	All 8 frame synchronization words are made out of a single PN code	All 8 frame synchronization words have +4 or -4 out-of-phase coefficient and minus peak value at middle shift.
Autocorrelation function	$R(\tau)=15$, $\tau=0$ $R(\tau)=-1$, elsewhere	$R(\tau)=16$, $\tau=0$ $R(\tau)=-16$, $\tau=8$ $R(\tau)=0,+4$, or -4, elsewhere

FIG. 28A

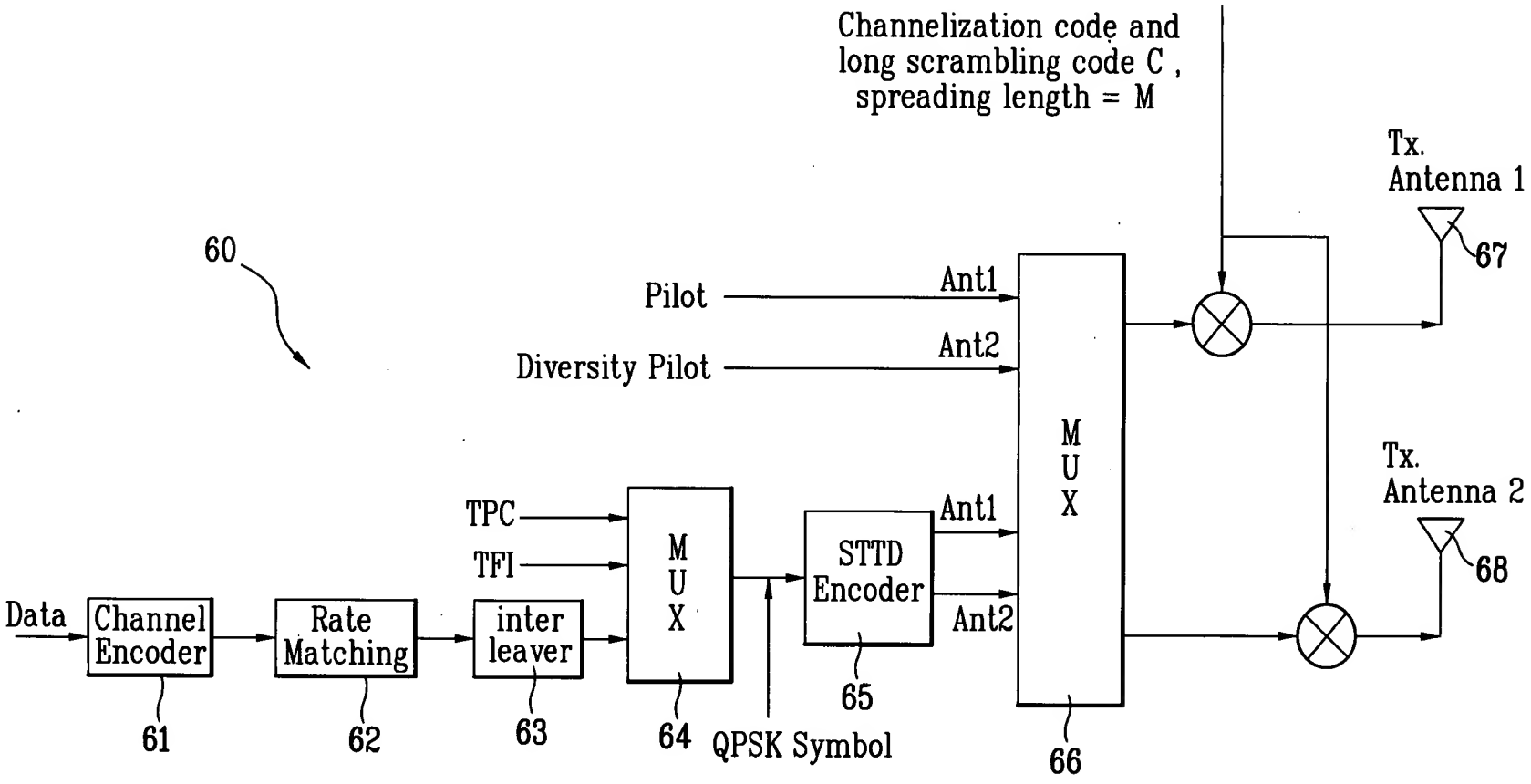
Channelization code and
long scrambling code C ,
spreading length = M
Tx.
Antenna 1
67
60
Pilot
Ant1
Diversity Pilot
Ant2
M
U
X
Tx.
Antenna 2
68
TPC
TFI
M
U
X
Ant1
STTD
Encoder
Ant2
Data
Channel
Encoder
Rate
Matching
inter
leaver
65
61
62
63
64
QPSK Symbol
66

FIG. 28B

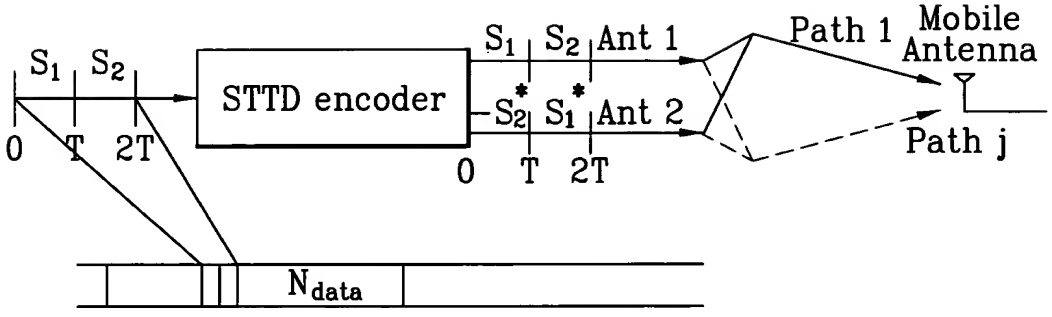
S1 S2
0 T 2T
STTD encoder
S1 S2 Ant 1
S2* S1* Ant 2
0 T 2T
Path 1
Mobile Antenna
Path j
Ndata

FIG. 29A

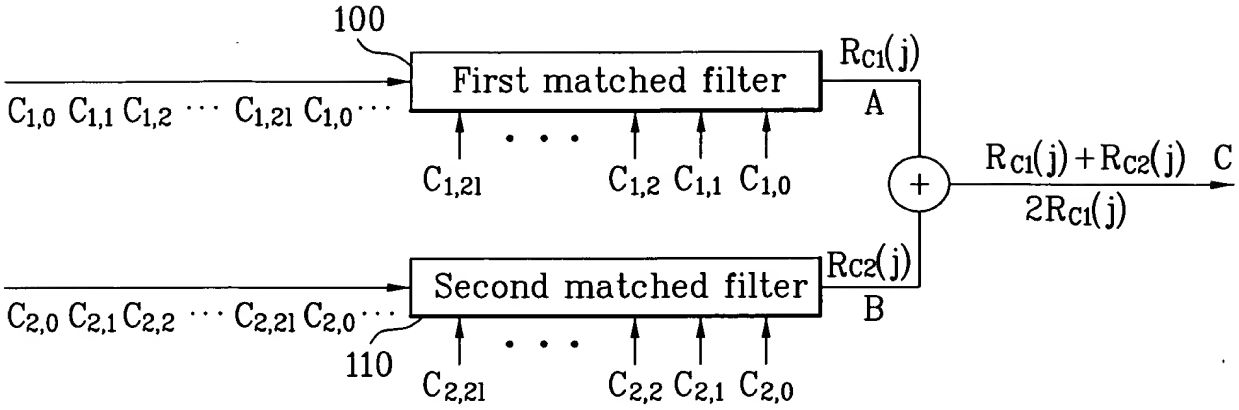

FIG. 29B

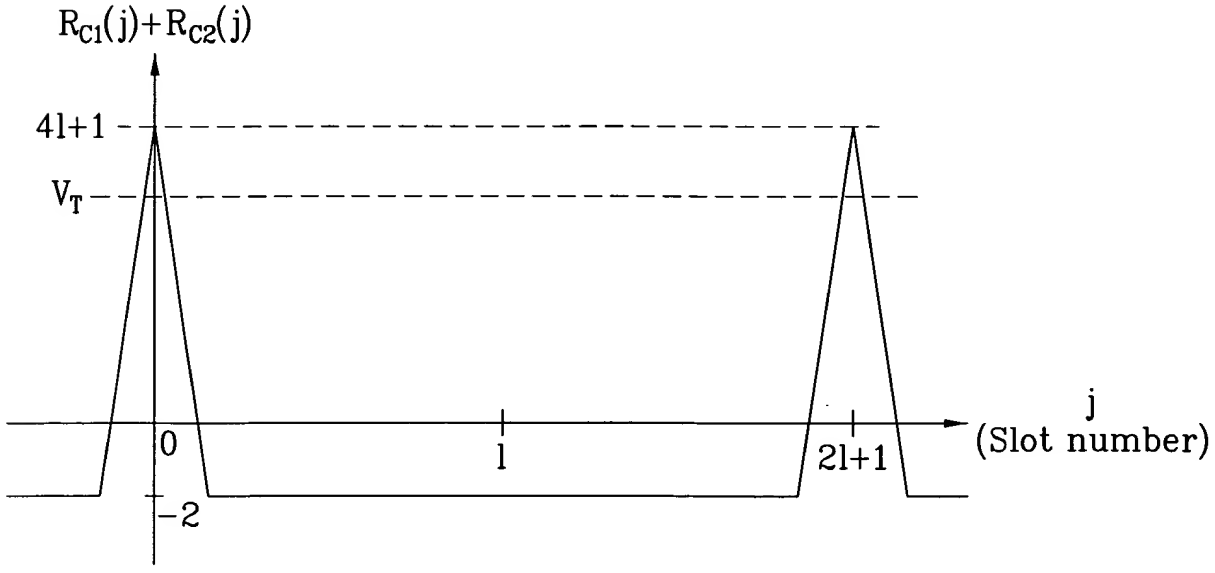

FIG. 30A

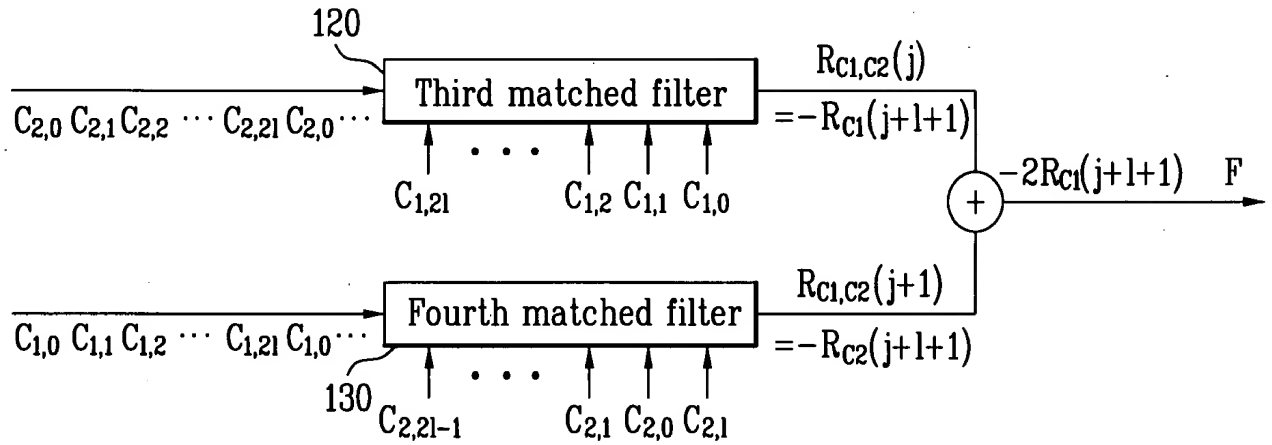
120
Third matched filter
$C_{2,0}\ C_{2,1}\ C_{2,2} \cdots C_{2,21}\ C_{2,0} \cdots$
$C_{1,21}$
$C_{1,2}\ C_{1,1}\ C_{1,0}$
$R_{C1,C2}(j)$
$=-R_{C1}(j+l+1)$
$-2R_{C1}(j+l+1)$
F
Fourth matched filter
$C_{1,0}\ C_{1,1}\ C_{1,2} \cdots C_{1,21}\ C_{1,0} \cdots$
130
$C_{2,21-1}$
$C_{2,1}\ C_{2,0}\ C_{2,1}$
$R_{C1,C2}(j+1)$
$=-R_{C2}(j+l+1)$

FIG. 30B

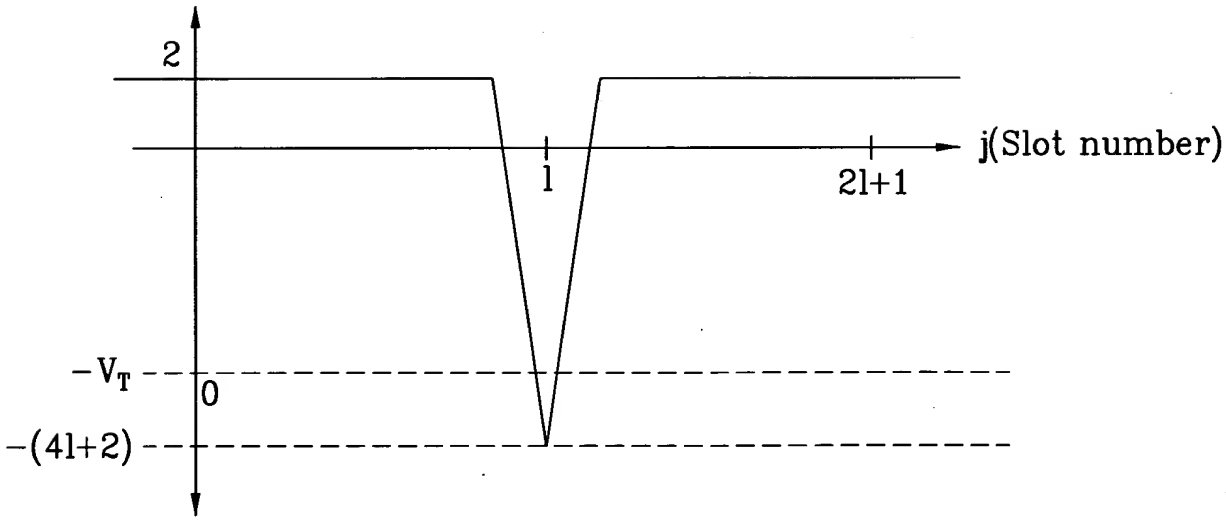

FIG. 31

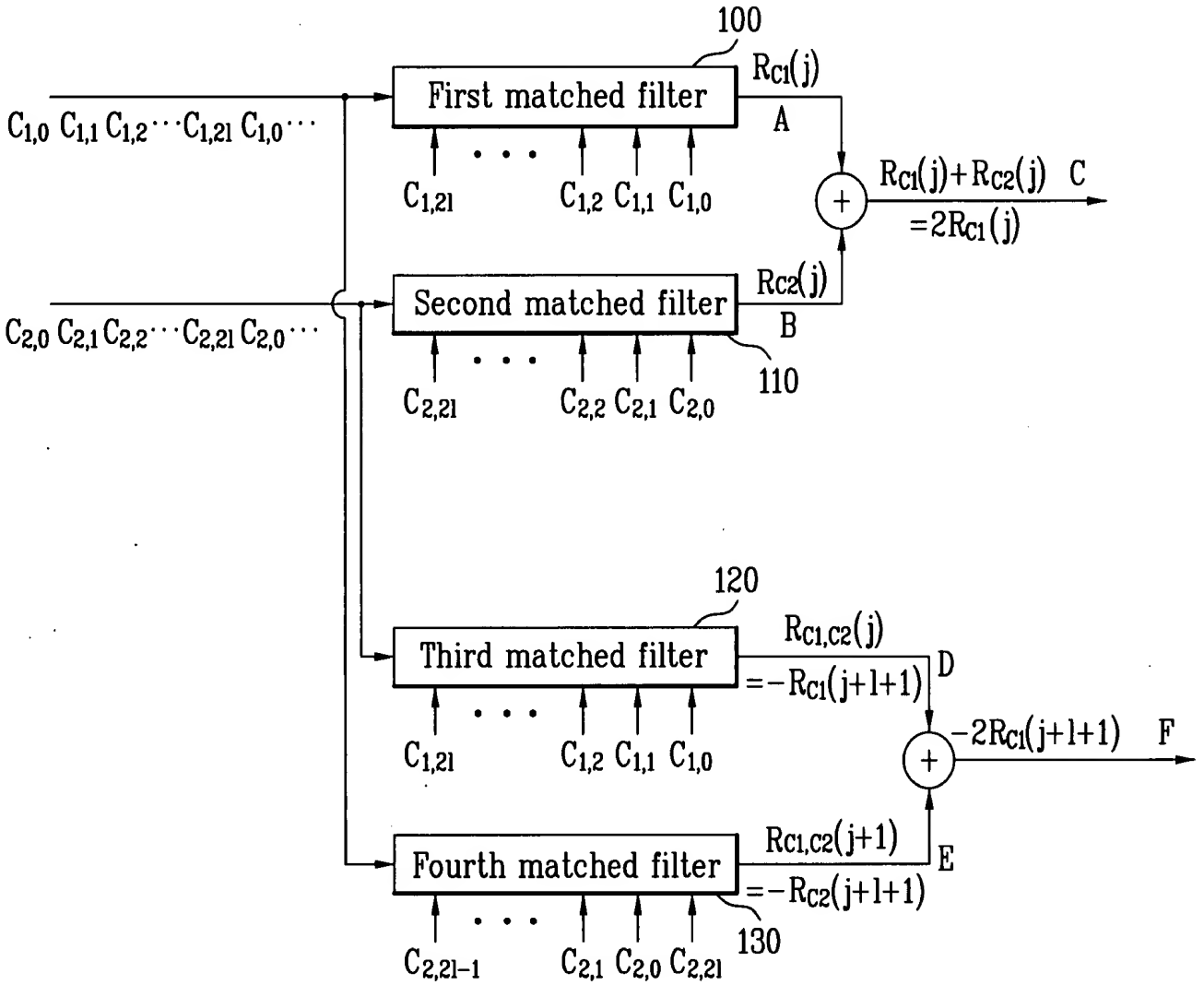
100
First matched filter
$R_{C1}(j)$
A
$C_{1,0}$ $C_{1,1}$ $C_{1,2}$ ··· $C_{1,21}$ $C_{1,0}$ ···
$C_{1,21}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
+
$R_{C1}(j)+R_{C2}(j)$ C
$=2R_{C1}(j)$
$R_{C2}(j)$
B
Second matched filter
$C_{2,0}$ $C_{2,1}$ $C_{2,2}$ ··· $C_{2,21}$ $C_{2,0}$ ···
$C_{2,21}$ $C_{2,2}$ $C_{2,1}$ $C_{2,0}$
110
120
$R_{C1,C2}(j)$
$=-R_{C1}(j+1+1)$
D
Third matched filter
$C_{1,21}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
+
$-2R_{C1}(j+1+1)$ F
$R_{C1,C2}(j+1)$
E
$=-R_{C2}(j+1+1)$
Fourth matched filter
$C_{2,21-1}$ $C_{2,1}$ $C_{2,0}$ $C_{2,21}$
130

FIG. 32A

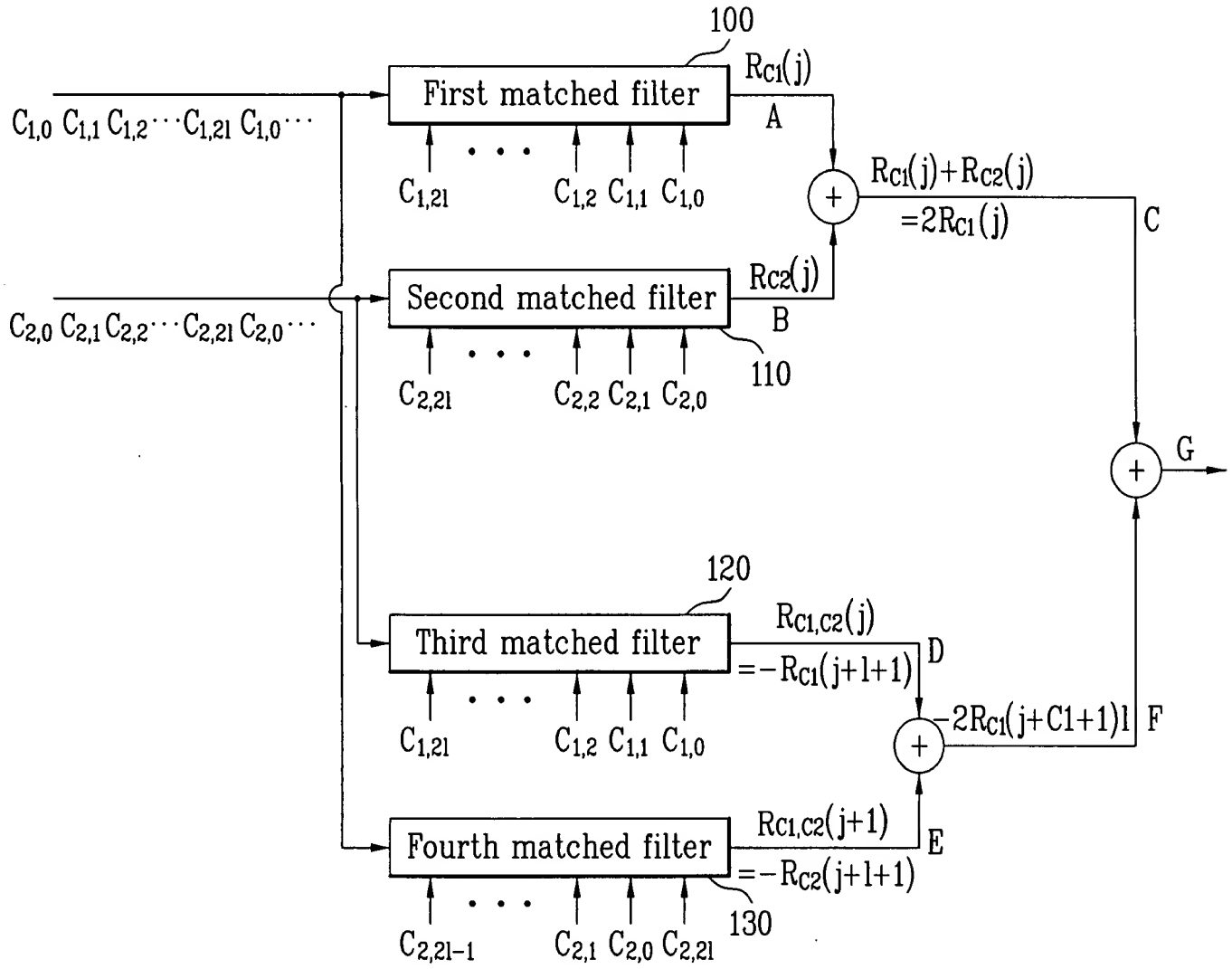
100
First matched filter
$R_{C1}(j)$
A
$C_{1,0}$ $C_{1,1}$ $C_{1,2}$ $\cdots$ $C_{1,21}$ $C_{1,0}$ $\cdots$
$C_{1,21}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
$R_{C1}(j)+R_{C2}(j)$
$=2R_{C1}(j)$
C
$C_{2,0}$ $C_{2,1}$ $C_{2,2}$ $\cdots$ $C_{2,21}$ $C_{2,0}$ $\cdots$
Second matched filter
$R_{C2}(j)$
B
110
$C_{2,21}$ $C_{2,2}$ $C_{2,1}$ $C_{2,0}$
G
120
Third matched filter
$R_{C1,C2}(j)$
$=-R_{C1}(j+1+1)$
D
$C_{1,21}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
$-2R_{C1}(j+C1+1)1$
F
Fourth matched filter
$R_{C1,C2}(j+1)$
$=-R_{C2}(j+1+1)$
E
130
$C_{2,21-1}$ $C_{2,1}$ $C_{2,0}$ $C_{2,21}$

FIG. 32B

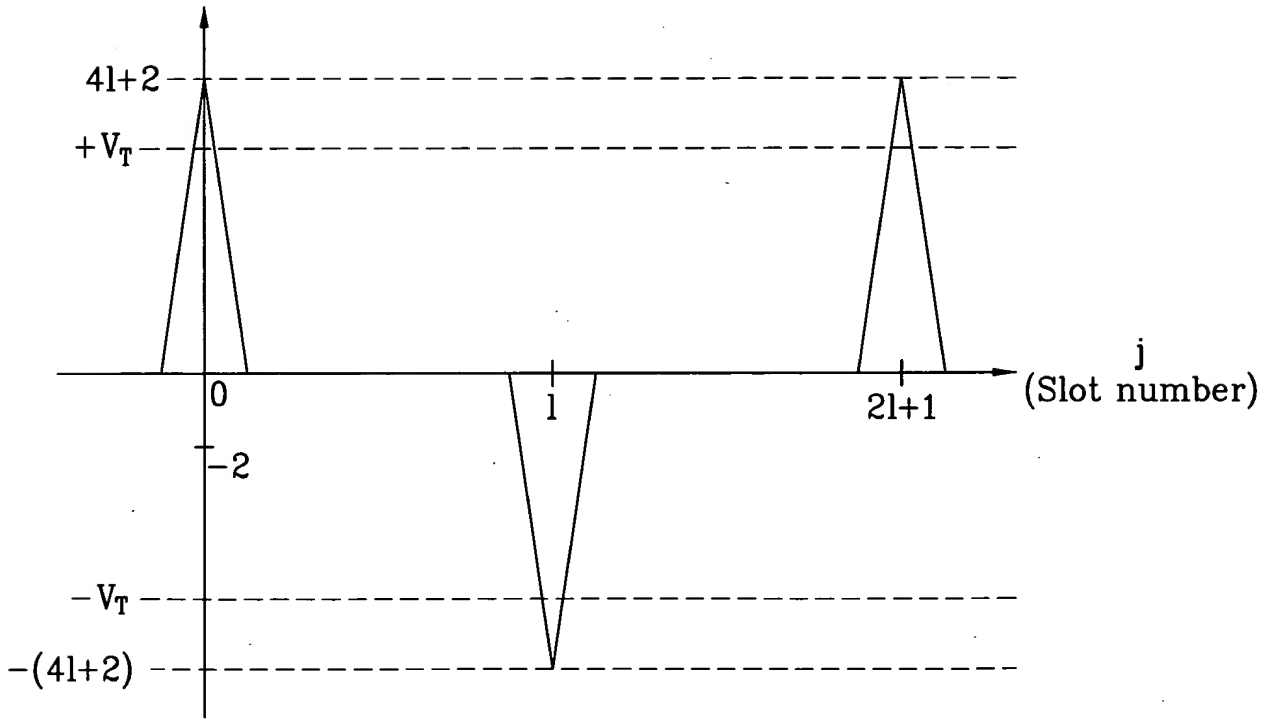

FIG. 33A

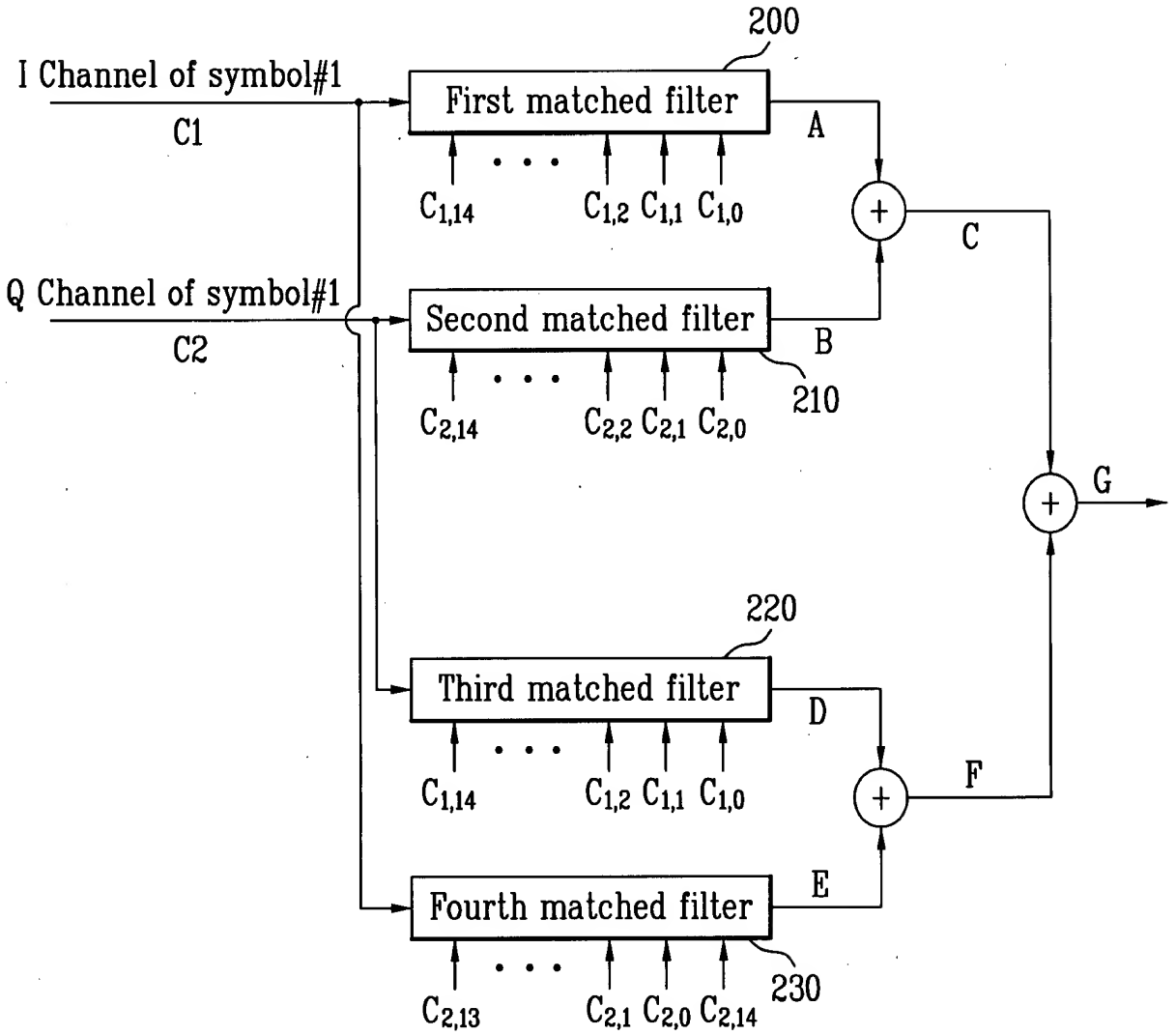
200
I Channel of symbol#1
C1
First matched filter
A
$C_{1,14}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
+
C
Q Channel of symbol#1
C2
Second matched filter
B
210
$C_{2,14}$ $C_{2,2}$ $C_{2,1}$ $C_{2,0}$
+
G
220
Third matched filter
D
$C_{1,14}$ $C_{1,2}$ $C_{1,1}$ $C_{1,0}$
+
F
Fourth matched filter
E
230
$C_{2,13}$ $C_{2,1}$ $C_{2,0}$ $C_{2,14}$

FIG. 33B

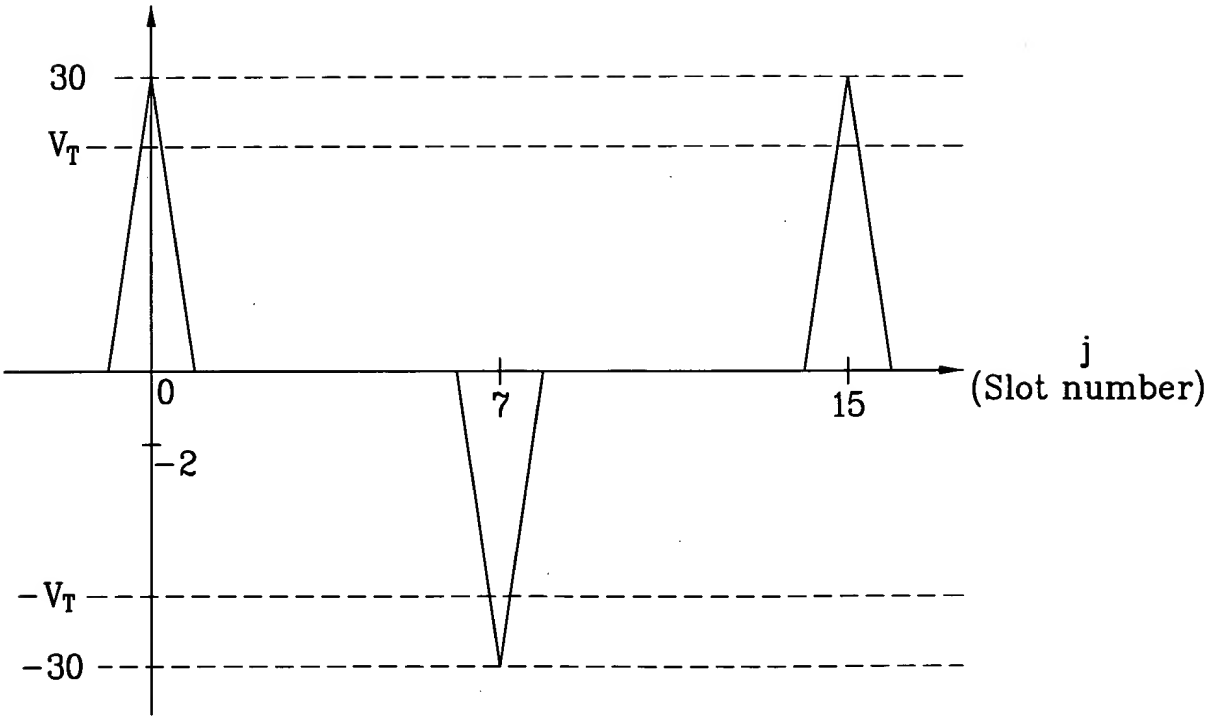

FIG. 34

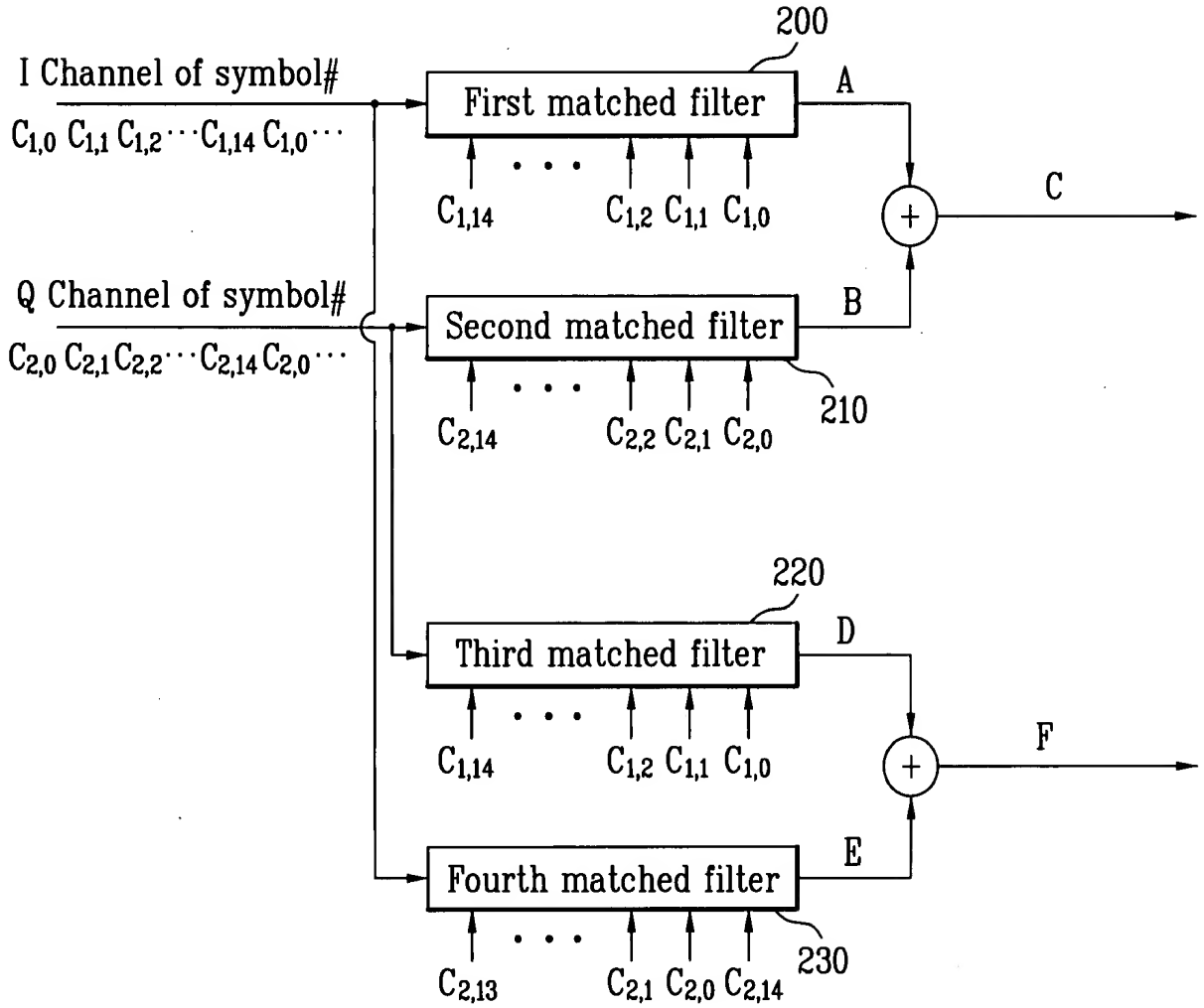
200
I Channel of symbol#
$C_{1,0}\ C_{1,1}\ C_{1,2}\cdots C_{1,14}\ C_{1,0}\cdots$
First matched filter
A
$C_{1,14}$
$C_{1,2}\ C_{1,1}\ C_{1,0}$
C
Q Channel of symbol#
$C_{2,0}\ C_{2,1}\ C_{2,2}\cdots C_{2,14}\ C_{2,0}\cdots$
Second matched filter
B
210
$C_{2,14}$
$C_{2,2}\ C_{2,1}\ C_{2,0}$
220
Third matched filter
D
$C_{1,14}$
$C_{1,2}\ C_{1,1}\ C_{1,0}$
F
Fourth matched filter
E
230
$C_{2,13}$
$C_{2,1}\ C_{2,0}\ C_{2,14}$

FIG. 35A

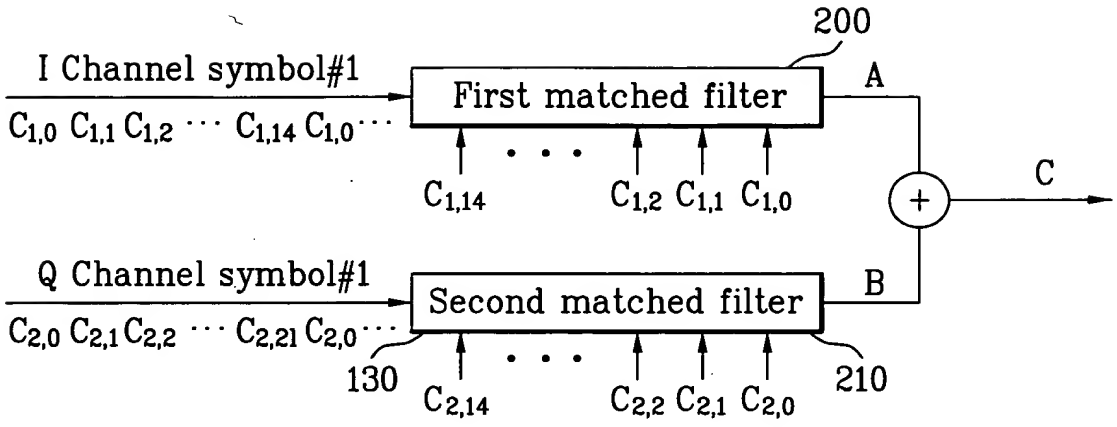

FIG. 35B

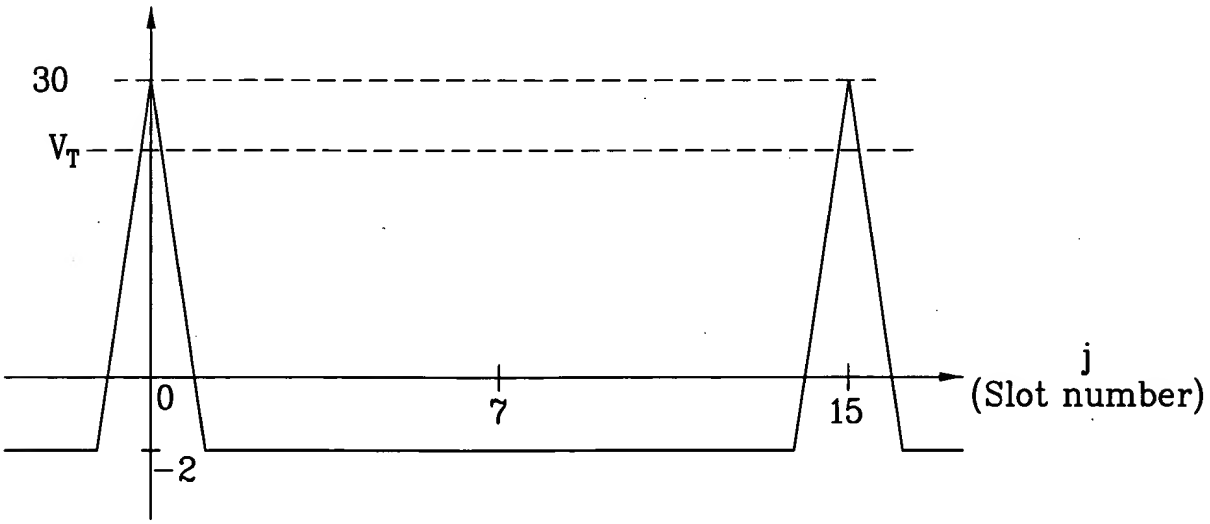

FIG. 36A

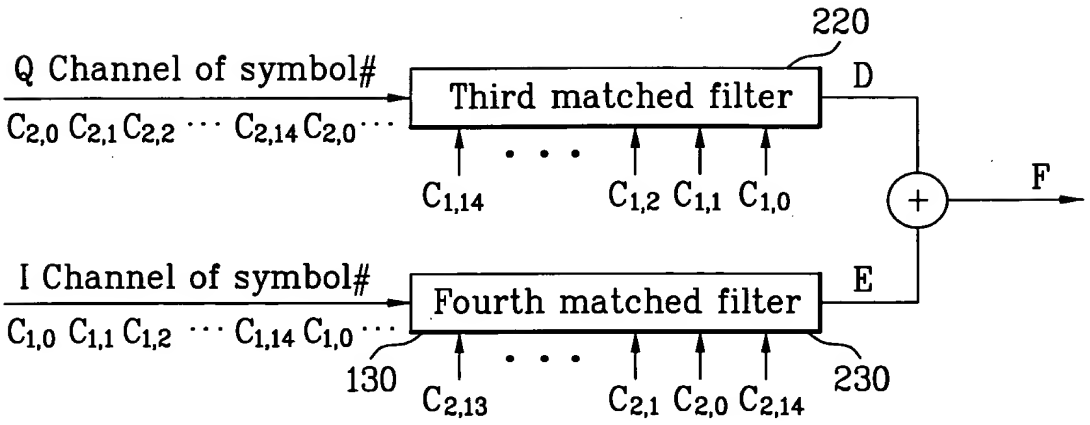

FIG. 36B

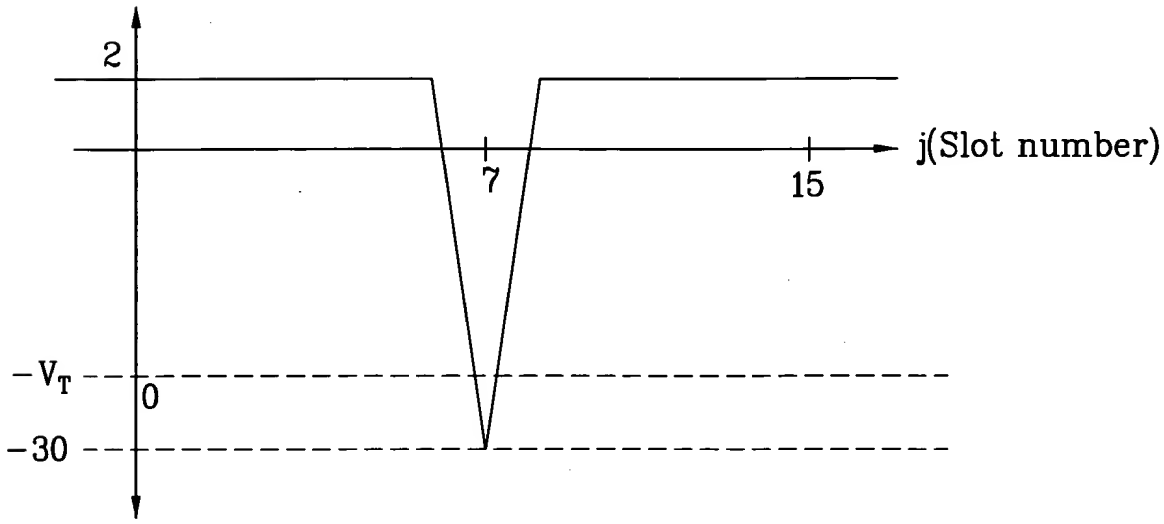

FIG. 37

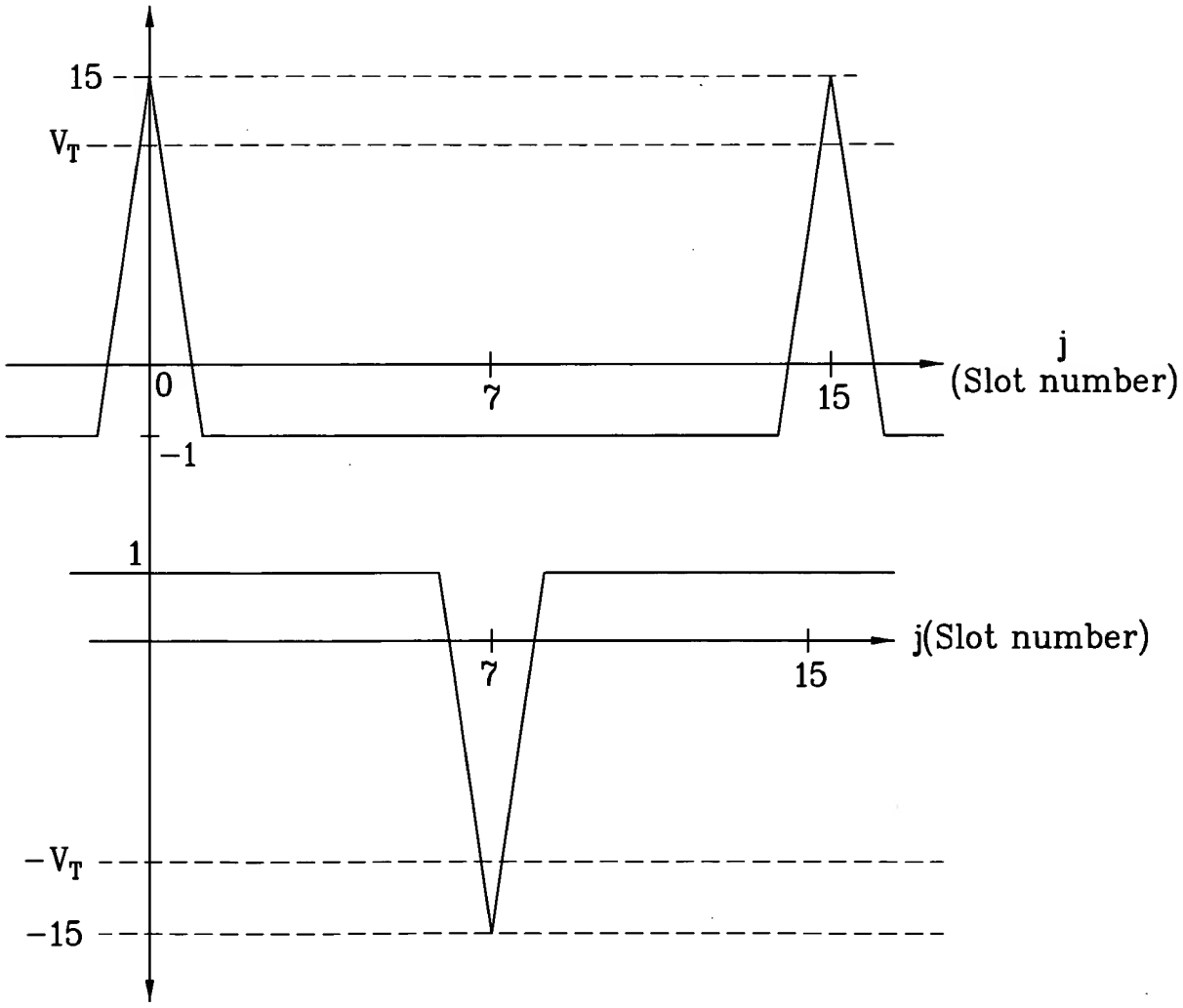

FIG. 38

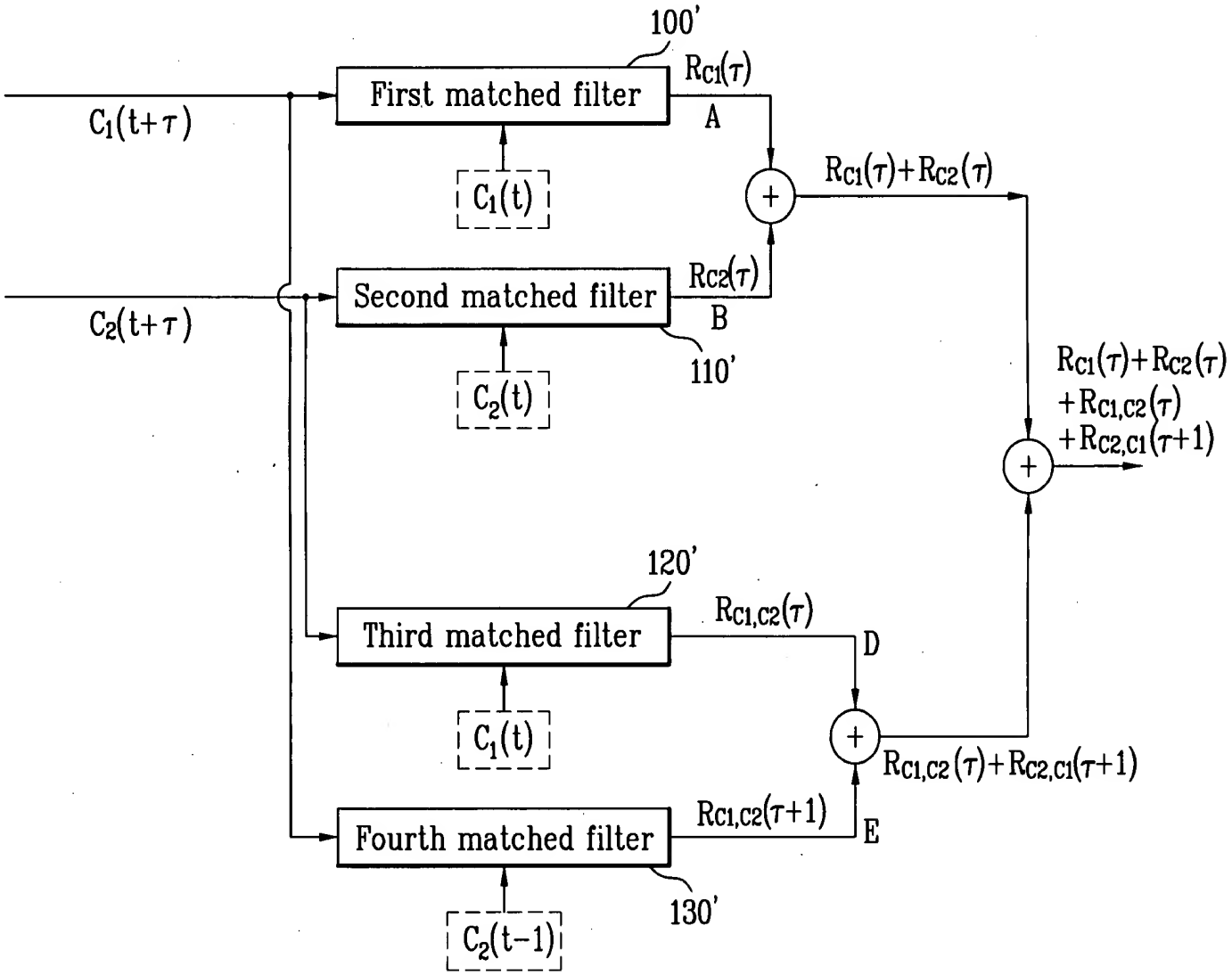
100'
First matched filter
$R_{C1}(\tau)$
A
$C_1(t+\tau)$
$C_1(t)$
$R_{C1}(\tau)+R_{C2}(\tau)$
$C_2(t+\tau)$
Second matched filter
$R_{C2}(\tau)$
B
110'
$C_2(t)$
$R_{C1}(\tau)+R_{C2}(\tau)$
$+R_{C1,C2}(\tau)$
$+R_{C2,C1}(\tau+1)$
120'
Third matched filter
$R_{C1,C2}(\tau)$
D
$C_1(t)$
$R_{C1,C2}(\tau)+R_{C2,C1}(\tau+1)$
$R_{C1,C2}(\tau+1)$
Fourth matched filter
E
130'
$C_2(t-1)$

FIG. 39A

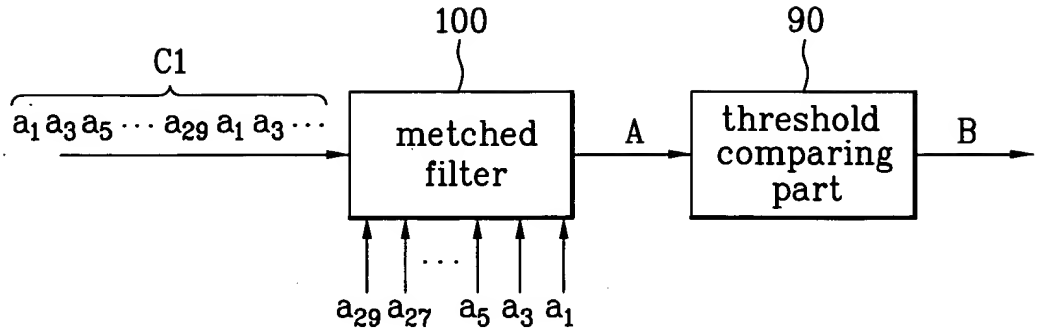

FIG. 39B

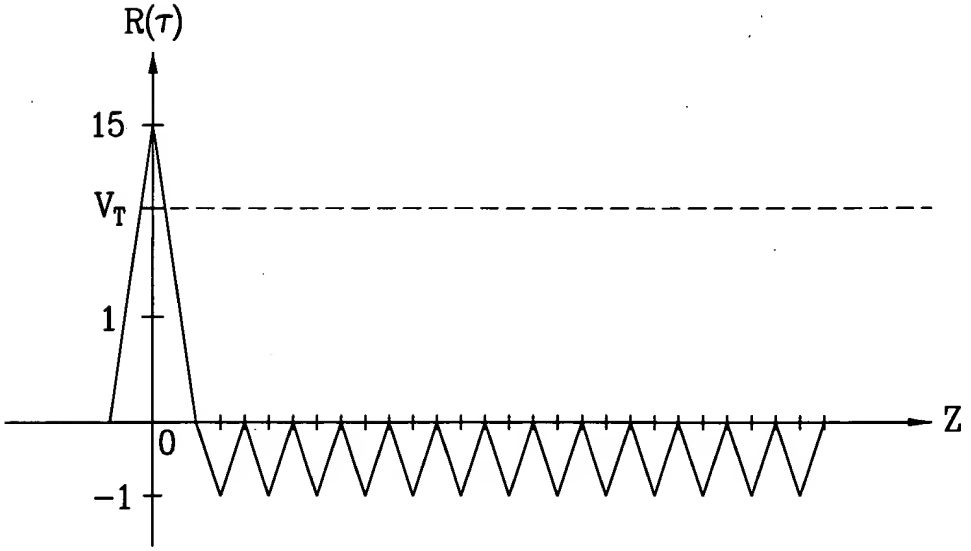

FIG. 40A

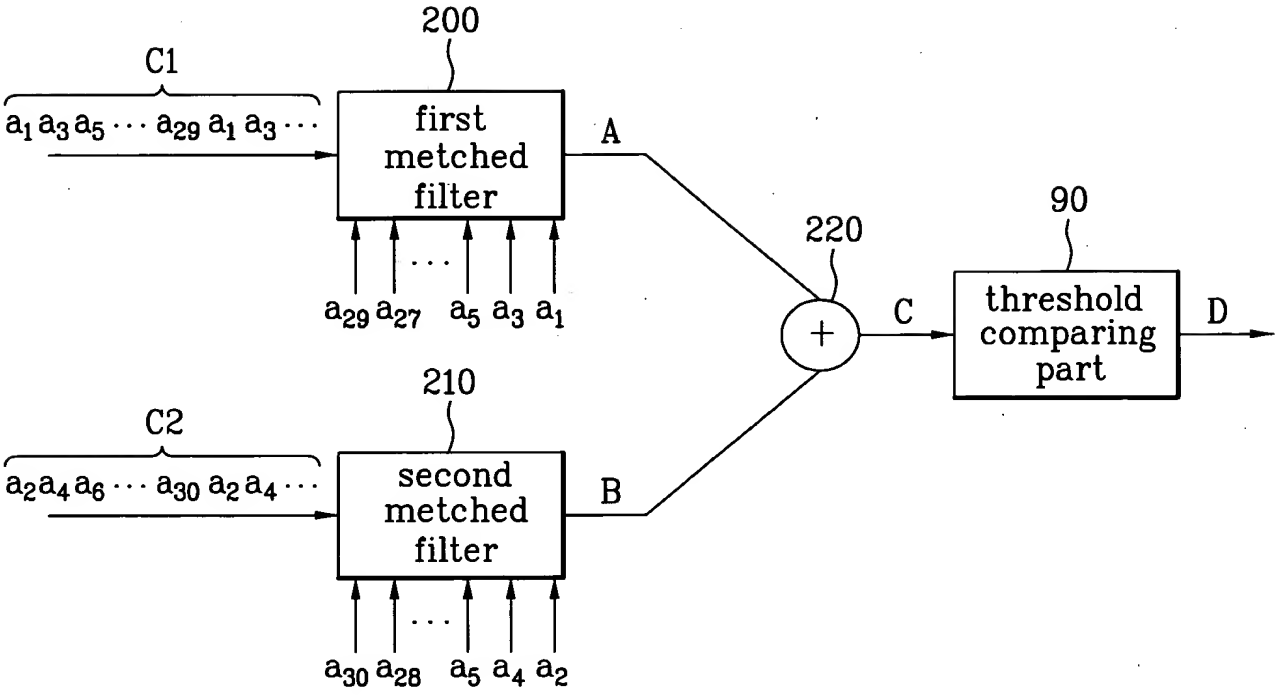

FIG. 40B

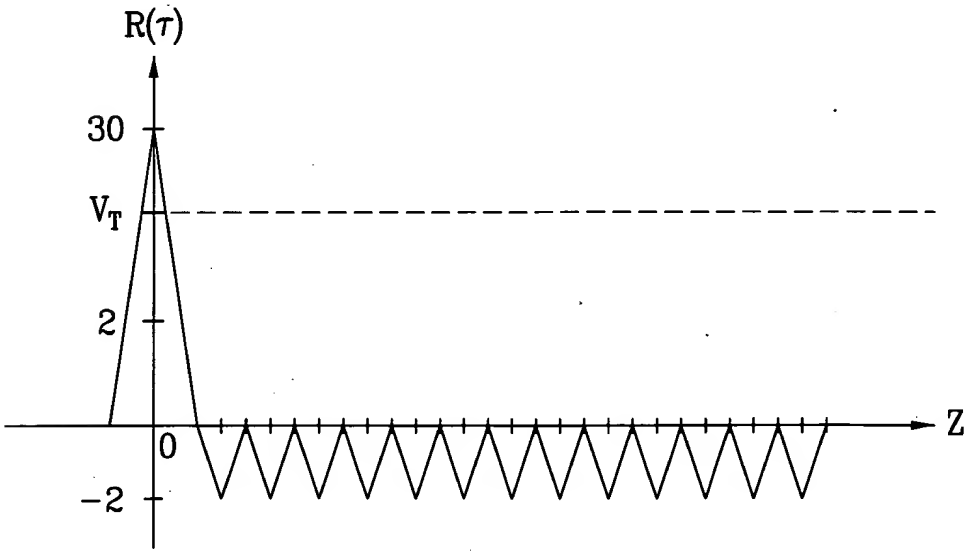

FIG. 41A

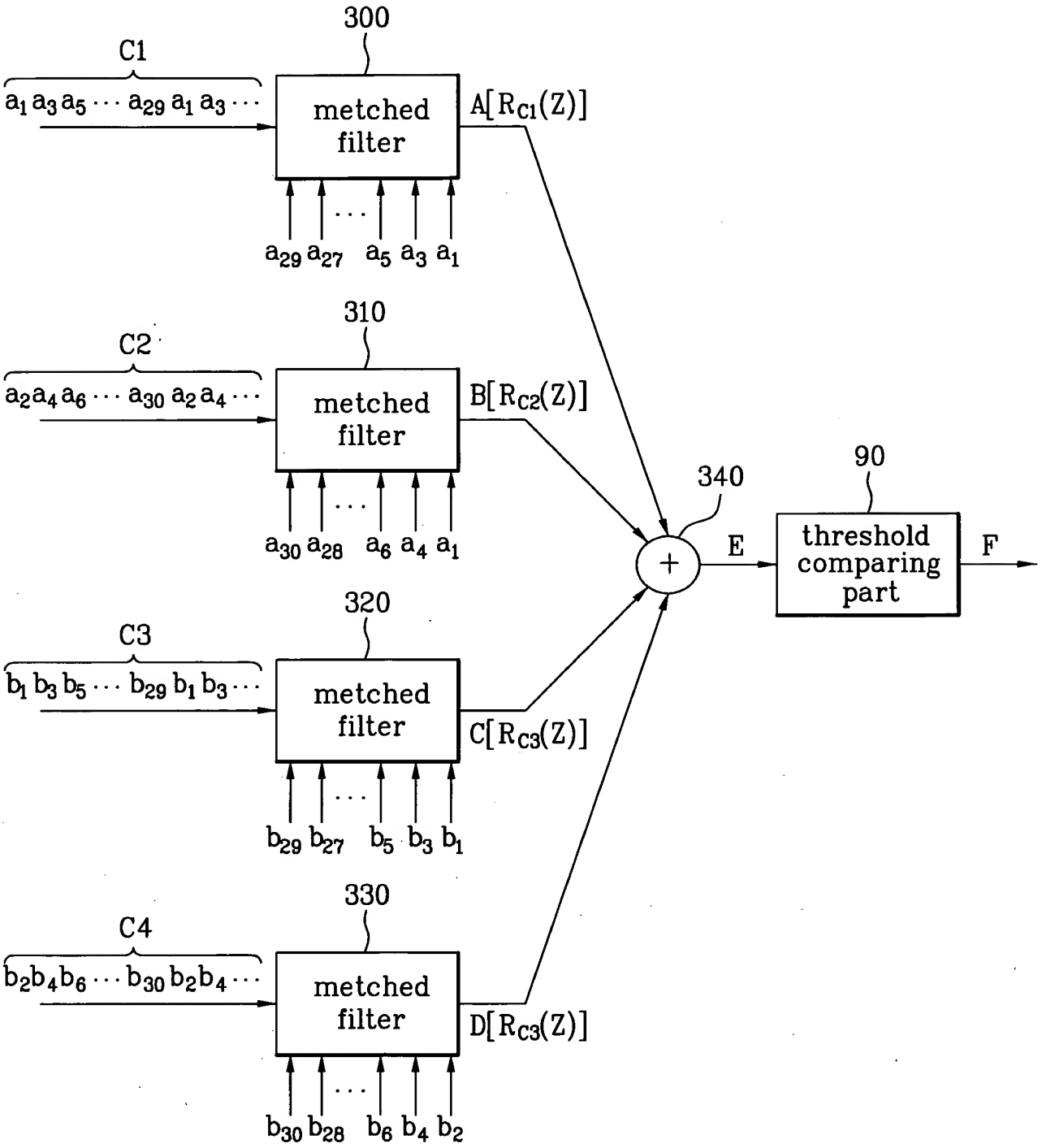
300
C1
$a_1 a_3 a_5 \cdots a_{29} a_1 a_3 \cdots$
metched filter
A[$R_{C1}(Z)$]
a_{29} a_{27} a_5 a_3 a_1
310
C2
$a_2 a_4 a_6 \cdots a_{30} a_2 a_4 \cdots$
metched filter
B[$R_{C2}(Z)$]
a_{30} a_{28} a_6 a_4 a_1
320
C3
$b_1 b_3 b_5 \cdots b_{29} b_1 b_3 \cdots$
metched filter
C[$R_{C3}(Z)$]
b_{29} b_{27} b_5 b_3 b_1
330
C4
$b_2 b_4 b_6 \cdots b_{30} b_2 b_4 \cdots$
metched filter
D[$R_{C3}(Z)$]
b_{30} b_{28} b_6 b_4 b_2
340
+
E
90
threshold comparing part
F

FIG. 41B